A

SYNOPSIS,

OR,

Short Analytical VIEW

OF

CHEMISTRY.

Tranſlated from the *High-Dutch* of
Dr. GODFREY ROTHEN.

By *ALEXANDER MACBEAN*, A.M.

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To Dr. *SHAW.*

SIR,

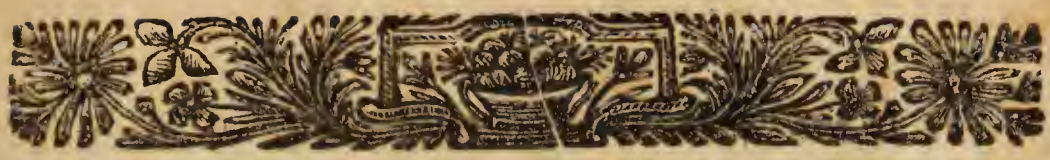
I Beg Leave to inſcribe the following Tranſlation to you, as to a proper Judge in the Subject. By our excellent Performances in this Kind, you have deſerved well not only of Chemiſtry, but of the Nation in general; as your laudable Endeavours of promoting ſo uſeful an Art among Trading People may ſerve the moſt valuable Purpoſes. Suffer me alſo, in this publick manner, to teſtify my ſenſe of your Friendſhip, and to declare with how much Reſpect I am,

SIR,

Your moſt obliged,

Humble Servant,

Alexander Macbean.



PREFACE.

OUR *Author*, *Dr.* Godfrey Rothen, *was Scholar to the celebrated* Stahl, *and a practising Physician afterwards at* Leipsic. *The early Death of so excellent a Person, he having scarce reached the One and Thirtieth Year of his Age, must have been a considerable Loss to the World, as sufficiently appears from the following Performance: A Work in such high Repute in* Germany, *that many of the Professors there put it into the Hands of their Pupils, and read Chemical Colleges or Lectures thereon; not to mention the Character given of it in several literary Journals, particularly the* Acta Medicorum Berolinensium: *But after all, we had much rather the judicious Reader should find it an useful Work in the Perusal, than barely such in our own, or others Encomiums.*

It

PREFACE.

It is much to be regretted, that ſo valuable an Art as Chemiſtry, ſhould be ſo little regarded among us, where it might turn to the beſt Account. In able and judicious Hands, and when duly applied, it ſeems productive of the greateſt Good; ſcarce an uſeful Art or Science, to which its Influence does not extend. By its Means we gain a deeper Inſight into Nature, and by it a Way is opened for the Diſcovery of new Arts and Trades, and of greatly improving thoſe already diſcovered, whereby the Limits of Commerce might be conſiderably enlarged: And of what Conſequence ſuch an Art is to a trading People, the Reader need not be told.

In this Tranſlation we have omitted the ſecond Section of the ſecond Part, entitled, The Chemical Proceſſes, *both as it is not the Work of our Author, but added by ſome other Hand; and as it contains nothing new or extraordinary.*

There was lately publiſhed a French *Tranſlation of this Work by M.* Clauſier, *a Phyſician at* Paris: *The Tranſlator in his Advertiſement calls it,* A faithful; *the Faculty of Phyſicians*

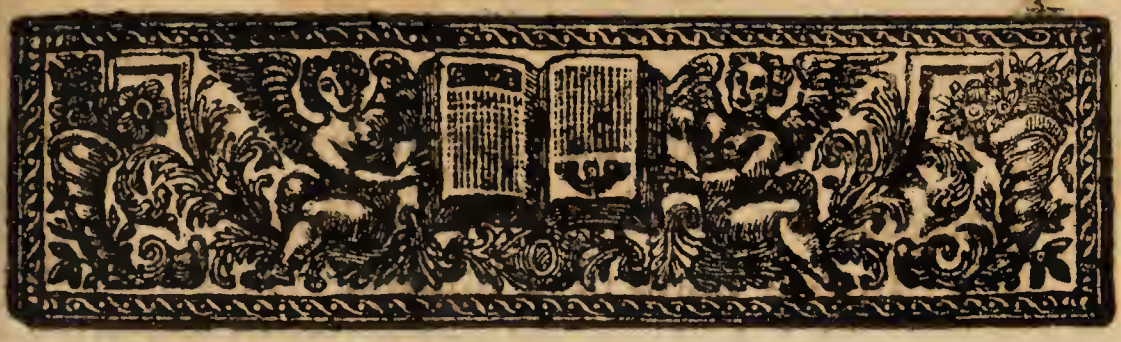
PREFACE.

Physicians at Paris *in their Approbation*, A faithful and exact Translation: *But how far this is true, may be judged from comparing it with the Original.*

The following Translation is submitted to the Candor of the Reader: If in the Perusal it should not prove an elegant one, it may at least, we hope, lay claim to some Degree of Exactness and Fidelity.

CORRIGENDA.

P. 32. l. 11. for *acidish* r. *neutral.* P. 54. l. 9. for *this* r. *thus.* P. 69, 85, 88, 99. r. *Grund-mixtion.* P. 95. l. 18. for *Salsa* r. *Salia.* P. 100. l. 6, 7. r. *Phlogistic.*



A SYNOPSIS of

CHEMISTRY.

HEMISTRY is divided into Physical and Pharmaceutical; the Physical Part comprehends Alchemy, Metallurgy, the Mechanical, Oeconomical, and Curious Chemistry; and the Pharmaceutical regards the Preparation of Medicines.

In each we are to consider the Operations and Productions. The Chemical Operations change, I. The Solidity and Dryness of Bodies. II. Their Union and Cohesion. III. Their Property of abiding or bearing the Force of the Fire. IV. Their Continuity; and in Metals, their Ductility.

I. The Solidity and Dryneſs of Bodies are changed, by making them paſs,

1. Into a State of Fluidity. 1. By Solution, which is done either by liquid Menſtruums, in the humid way; or, by ſaline and ſulphureous Concretes, by means of Fuſion in the dry way. 2. By Extraction, which is a partial Solution. 3. By Amalgamation which renders Metals ſoft and fluid, and in ſome degree diſſolves them by means of running Mercury. 4. By Solution *per deliquium* which is done by the humid Vapours intermixed with our Atmoſphere.

2. Into a ſolid and dry Conſiſtence. 1. By Coagulation, Inſpiſſation, Evaporation and Abſtraction. 2. By Cryſtalliſation. 3. By Precipitation.

II. The Union and Coheſion of Bodies with earthy, viſcous and watry Parts are changed, 1. By Digeſtion and Maceration 2. Fermentation, which produces ardent Spirits. 3. Putrefaction, which produces urinous Spirits. 4. Diſtillation, which is performed three ſeveral ways: *Per deſcenſum*; *ad latus*, or by the Retort; and *per aſcenſum*, by the Cucurbit or Alembic. 5. Rectification, which

is

is no other than a repeated Diſtillation. 6. By Dephlegmation, and Concentration.

III. The Property of abiding or enduring the Fire is changed,

1. By Sublimation, whereby Subjects already volatile of themſelves are raiſed, either in a ſubtile Powder, called Flowers; or in a denſe and ſolid Body, generally called Sublimate.

2. By Volatiliſation, whereby Subjects otherwiſe fix'd are diſſipated or raiſed.

3. Fixation, which fixes Bodies either naturally volatile, or volatiliſed by Art; that is, renders them capable of enduring the Fire, either in part, as Turbith mineral; or totally, as Bezoar mineral.

IV. The Continuity of Bodies and the Ductility of Metals are changed,

1. By depriving them of it, 1. By Calcination, either by means of the Flame of an open Fire, as in Reverberation; by means of Nitre, as in Detonation; or by means of other ſaline and ſulphureous Concretes, as in Cementation with Sulphur, Arſenic, Salt, Vitriol, &c. and in the Deſtruction of Metals by Zink.

2. By restoring Continuity and Ductility. 1. By Reduction, for Metals, and some other metallic Substances. 2. By Revivification, for Mercury.

The Chemical Productions are, I. Saline. II. Sulphureous. III. Earthy.

I. Saline Productions are, 1. Alkali's. 2. Acids. 3. Neutrals.

1. Alkali's are, 1. Fixt, as Salt of Tartar, Pot-ash, fixt Nitre, the black Flux, Soda of *Spain*; the Salts of Wormwood, Carduus Benedictus, Rest-harrow, Broom, Bean-Stalks, *&c.* 2. Volatile, as the Spirits and volatile urinous Salts of Hartshorn, Vipers, Urine, Soot, Lees of Wine, Spirit of Sal-ammoniac, both the simple, and that prepared with Quick-lime.

2. Acids. 1. Acids without Addition; as first, the vitriolic Sulphureous: To which Head belong the Spirit and Oil of Sulphur *per Campanam*, the Spirit and Oil of Vitriol, Spirit of Alum, and the *Spiritus Aperitivus Penoti.* Secondly, Nitrous Acid; of which Class are the common Spirit of Nitre, Aqua fortis, Aqua regis, and *Hoffman*'s smoaking Spirit. Thirdly, the Acid of Sea-Salt; as

Spirit

Spirit of Salt, philoſophical Spirit of Vitriol, and Butter of Antimony. 2. Acids dulcified by Spirit of Wine; as the ſweet or dulcified Spirits of Vitriol, Nitre and Salt.

3. Neutrals; and, 1. Thoſe properly ſo called, and otherwiſe denominated, *Enixa*, middle and digeſtive Salts; and they are either fixt, as vitriolated Tartar, the *Arcanum duplicatum*, *Nitrum Antimoniatum*, *Nitrum regeneratum*, *Glauber's Sal mirabile:* Or Volatile, which fly off in the Fire, either in part, as the *Terra foliata Tartari*, *Tartarus tartariſatus*, *Tartarus ſolubilis*; or totally, and that either in a dry Form, as *Glauber's Sal Ammoniacum ſecretum*; or in a liquid Form, as the *Liquor ſuccinatus C. C.* 2. Vitriolic and mercurial Salts, as Vitriol of Iron and Copper, Cryſtals of Verdigreaſe, green Precipitate, Cryſtals of Silver, Sugar of Lead, various martial and ſolar Tinctures, Mercury-ſublimate, common Precipitate, and Turbeth mineral.

II. Sulphureous Productions are, 1. Liquid and volatile. 2. Of a mean Conſiſtence. 3. Dry and ſolid.

1. The Liquid and Volatile comprehend, 1. Diſtilled Oils, both Æthereal and Empy-

reumatic. 2. Ardent Spirits, prepared either by simple Fermentation, as Spirit of Wine, Corn-Spirits, and Spirit of Juniper-berries, *&c.* Or by Confermentation, as Spirit of Roses with Sugar, Spirit of Elder-flowers with new Beer: Or by Abstraction, as Spirit of Lillies of the Valley, along with Wine or Spirit of Wine; and the various apoplectic, anti-epileptic, anti-hysteric, *&c.* Waters.

2. Sulphureous Productions of a mean Consistence include, 1. The Essences and Extracts prepared chiefly from Vegetables. 2. Expressed Oils.

3. The dry and solid sulphureous Productions are the Rosins of Jalap, Scammony, the Lac Sulphuris, Flowers of Sulphur, of Benjamin, Cinnabar, and Phosphorus.

III. Earthy Productions are, 1. Either entirely fixt, as diaphoretic Antimony, Cerus of Antimony, Bezoar mineral, the *Terra vitrioli dulcis*, the various Crocus's of Iron, of Copper, Shells prepared and calcined, burnt Hartshorn. 2. In part volatile in the Fire, as Crocus Metallorum, Glass of Antimony, Regulus of Antimony, Mercurius Vitæ, Luna cornua, Plumbum cornuum, and most of the Magisteries prepared by Precipitation.

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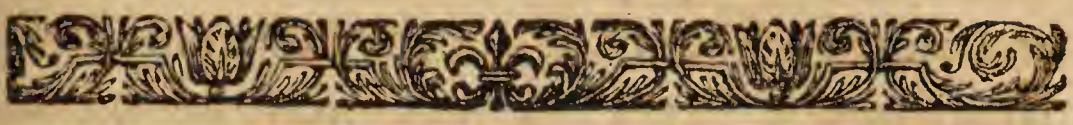


An Account of the Chemical Writers.

1. CHEMISTRY is the Art of ſeparating natural Bodies and their Parts, purifying and combining them, and of rendering them fitter for medicinal and other uſeful Purpoſes in Life.

2. And thus Chemiſtry is twofold, either Phyſico-mechanical, or Medico-pharmaceutical.

3. The former is without diſpute more ancient than the latter; and when it has for its Object not ſo much the Fuſion and Separation, as the Exaltation and Tranſmutation of Metals, it is then called Alchemy.

4. And thus we may make three Claſſes of Chemiſts and Chemical Writings. The firſt treat of Alchemy, or of the Exaltation and Tranſmutation of Metals: The ſecond, on Metallurgy, or the Smelting, Separating and Aſſaying of Metals; as alſo on the Art of Glaſs-making, Enamelling, Lackering, Dying, Soap-boiling; nay, even on the Arts of

Brewing, Cookery, and Baking: The third and last, on Pharmacy, or the Preparation of Medicines. Yet Chemistry may be more commodiously divided from the Consideration of its principal Operations, rather than from its Scope and End, into Zymotechny, Halotechny and Pyrotechny. To the latter do properly belong the Metallurgic Operations: To the second, Solutions, Precipitations, and the Productions thence arising by means of Salts; and to the third, Fermentation and the Effects thereon depending.

5. *Borrichius* has, in his *Conspectus Chemicorum illustrium*, given us a List of the Writers on Alchemy, together with a short Critic annexed.

6. The principal and most noted Alchemists among the Ancients are, *Hermes Trismegistus*, *Geber*, *Artephius*, *Arnoldus de Villa Nova*, *Raymond Lully*, and *Bernard* Count of *Trevisa:* Among the Moderns, *Alexander Van Suchten*, *Sendivogius*, *Philaletha*, *Mich. Mayer*, *Espagnet*, and *Pantaleon*. See more below, §. 11.

7. *Basil Valentine*, *Isaac Hollandus*, and *Theophrastus Paracelsus* were the first who taught how Chemistry, that had hitherto been almost entirely employ'd on the Exalta-

tion

tion and Tranſmutation of Metals, might with Advantage be applied to the Preparation of Medicines.

8. But ſuch Attempts met with great Oppoſition from many, who pretended that moſt Chemical Preparations gain from the Fire too great a Degree of Dryneſs and Violence, nay even a ſecret Poiſon: Whence it cauſed a long Struggle, before chemical Medicines could be ſufficiently legitimated, and unanimouſly introduc'd into the Shops. But in particular, *Thomas Eraſtus*, *Gabriel Fontanus*, and in the laſt Century, *Herman Conringius* were the warmeſt in the Oppoſition: The latter however was ſolidly refuted by *Borrichius*, partly in his Diſſertation *de Ortu & Progreſſu Chemiæ*, and partly in a peculiar Treatiſe *de Hermetis & Veterum Ægyptiorum Sapientia.*

9. *Dan. Sennertus, de Galenicorum & Chymicorum Con. & Diſſenſu*; *Laur. Hoffman de Remediorum Chymicorum vero uſu & vero abuſu*; and *Schraderus de Remediorum Chymicorum pariter ac Galenicorum neceſſitate*, took upon them the Part of Moderators in the Diſpute.

10. The following Authors however have gained the greateſt Reputation in pharmaceu-

tical Chemistry, *viz. Crollius, Quercetanus, Beguinus, Hartman, Poppius*, and his Commentator *Agricola, Petrus Joh. Faber, Angelus Sala, Mynsicht, Zwelfer, Van Helmont, Tachenius, Michaelis, Etmuller, Fr. Hoffmann, Rolfinckius & Poterius*: Among the Moderns, *Febure, Glaser, Lemery, Le Mort, Barckhuysen, Juncken, Cardilucius, Ludovici, Wedelius, Bohnius, Stisserus & Fr. Hoffmann*, jun.

11. The Writers on Metallurgy or the Physico-mechanical Chemistry, are much the fewer in Number. And those who have treated of Metallurgy, as *Ulysses Aldrovandus, George Agricola, Encelius*, and others, have done it rather as Historians. Yet *Laz. Ercker, Becher*, and his Commentator, *Stahl*, the honourable Mr. *Boyle, Kunckel, Glauber*, and several anonymous Authors published by *Kelner*, furnish an useful Introduction to the Art.

Alchemical Writers are either,

I. *Nomenclators* and *Censors*; as *Borrichius* in his *Conspectus Chymicorum illustrium* already quoted, and the Author of the Treatise entitled, *Feg-feur der Chemisten*, the Chemists Purgatory.

II. Editors and Collectors of Pieces of different Authors; as *Joach. Tanckius, Joh. Tholden*,

Tholden, *Nathan Albinæus*, *Horlacher*, *Mangetus*, the Editors of the *Theatrum Chymicum*, *Ars Aurifera*, *Vellus Aureum*, and the *Muſæum Hermeticum*.

III. Theoretical Writers; as *Petrus Bonus Lombardus* in his *Margarita pretioſa*, *Clauderus de Tinctura Univerſali*, *Morhofius* and *Cramer* in their Diſſeratations *de tranſmutatione Metallorum*, *Becher* in his *Supplem. IIdum Phyſ. Subterran.* *Wedelius* in his *Introductio in Alchymiam*, *Filius Sendivogii*, and *Nuyſiment de Sale Philoſophorum*, Baron *Schroedter* in his *Bedencken vom goldmachen*, Thoughts on gold-making, *Wayz* in his *Bedeneken von der Alchymie*, Thoughts on Alchemy, as alſo the Author of the *Chymiſchen Zeig-und Wegweiſers*, Chemical Guide, and the three ſmall Treatiſes lately publiſhed; the firſt entitled, *Mineraliſches gluten*, mineral glowing Coals; the ſecond, *Philoſophiſches perlen-baum*, philoſophical Pearl-tree; the third, *das eröffnetes Cabinet der Natur*, the Cabinet of Nature opened.

IV. Claſſical Authors; as *Hermetis Triſmegiſti Tabula Smaragdina*, *Senioris Zadith Tabula Chymica*, *Geber*, *Arnoldus de Villa nova*, *Raymond Lully*, *Bernard Count* of *Treviſa*, *Roger Bacon*, *Ripley*, *Baſil Valentine*, *Theo-*

Theophrastus Paracelsus, *Sendivogius*, *Espagnet*, *Flamellus*, *Bazdorff*'s filum Ariadnes.

V. Controverted Adepts; as *Augurellus*, *Rupescissa*, *Philaletha*, *Pantaleon*, *Montesch-nyder*, der grosse und kleine Bauer, *Claveus*, *Christ*. *Democritus*.

VI. Anonymous Writers; as the Authors of the *Turba Philosophorum*, *Rosarium Philosophorum*, *Clangor Buccinæ*, *Cymbalum Aureum*, *Correctio Fatuorum*, *Consilium de Conjugio Massæ Solis & Lunæ*; as also, *das eröffnetes Philosophisches vater-hertz*, the philosophical Father's Heart opened; *Wasser Stein der Weisen*, Water-Stone of the Philosophers; *die Philosophischen Wassern*, the philosophical Waters, *via veritatis*, and the Treatise, *de Principiis Naturæ & Artis*.

VII. Authors of a lower Class; as *Erbinæus von Brandau*, *Edward Kelly*, *Ulricus Poysselius*, *Danstenius*, *Dionysius Zacharias*, *Lambspring*, *Thomas Norton*, and *Naxagoras*.

VIII. Writers who have published particular Experiments; as *Cassius de Auro*, *Ræschius* in his *Experimenta Osiandriana*, the Author of *Sol sine Veste*, *das Wunder-drey*, the wonderful three; *Alchymia denudata*, *die beschreibung eines bey Zwickau gefundenen gold-*

ischen

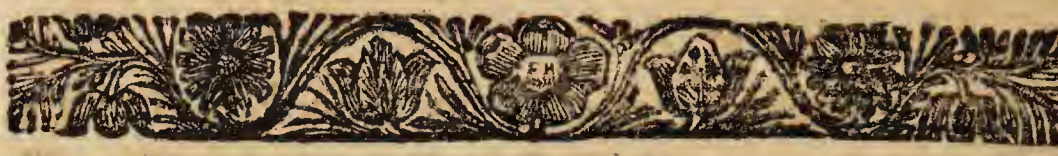
ischen Sandes, the Description of a Gold-Sand found near *Zwickau*.

IX. Process-retailers; as *Tanckius* in his *Promptuarium Alchymiæ*, *Becher* in *Chymischen glucks-hafen*, chemical fortunate Haven, *Kessler* in his *Centuriæ*, *Schmuck* and *Kellner* in the *Ærarium Chymicum*, *Neidhold* in the *Chymischen particular-Zeiger*, particular chemical Guide. And yet a Man need not regulate his alchemical Studies by this List or Order of Authors, as it is certain that the several Philosophers have had their own several Subjects, and consequently their several Encheireses, so that even an Adept might find it a difficult Matter to distinguish the genuine from the pretended Adepts; and hence it is Labour in vain, to attempt to reconcile the several Philosophers, as *Naxagoras* and others have proposed.

12. Now intending to treat Chemistry as a Physician, I shall confine myself principally to the pharmaceutical Branch.

13. Accordingly I shall divide the Work into two Sections; the first describing and exhibitting the Operations; the second, the chemical Productions.

SECT.



SECTION I.

The Operations of Chemistry.

CHAP. I.

Solution and Extraction.

1. SOLUTION or Dissolution commonly denotes one thing's taking into itself, or absorbing another, in such manner as no longer to be distinguishable from each other, but together make up one Body.

2. Now this happens either in the humid, or the dry way; *i. e.* either by means of certain Liquors and Humidities; or, by things that are dry, yet fluxile in the Fire, particularly Salts.

3. Such a Liquor as absorbs other Matters, and thus dissolves them, is called a *Menstruum*, or Solvent.

4. Now such is common Water, Vinegar and other acid vegetable Juices, Spirit of Wine

Wine, expreſſed and diſtilled Oils, the ſeveral Lixiviums of Lime and alcaline Salts; the urinous Spirits, acid mineral Spirits, Aqua fortis, Aqua regia, and Spirit of Salt, Spirit and Oil of Vitriol.

5. When not the entire Body of a thing, but a part only thereof is diſſolved, we call that an *Extraction.*

6. Should now the Menſtruum obtain a tranſparent red, yellow, green or blue Colour, that we call a *Tincture*; but in Caſe of an opaque, dark Colour, an *Eſſence*: tho' this Diſtinction be not always ſo accurately regarded.

7. To Extraction is reducible the drawing off Waters, Vinegar or Spirit of Wine from Simples, thoſe carrying along with them over the Helm the Smell and Flavour of the Simple, tho' the Colour be not thereby changed in the leaſt: And thus other Extractions, properly ſo called, exhibit no ſenſible Change in Colour; as Wine or Muſt, poured on Glaſs of Antimony, takes into itſelf ſomething of the Subſtance thereof; as appears from its emetic Virtue, and alſo from its Precipitation, tho' its Colour remain unaltered.

8. But

8. But as it is of great Importance to know which Menstruum is most adapted to any Subject, that each may have its own appropriated Solvent, we shall subjoin some Remarks on this Difference.

9. Common Water is the fittest Menstruum for dissolving and extracting Salts, Gums as Gum-arabic, Gum of the Cherry and Plum-tree; and Gum-rosins, as Gum-ammoniac, Bdellium, Sagapenum, Galbanum, Opopanax, *&c.* as also Gellies, or the subtile glutinous Parts of Vegetables and Animals.

10. Yet among Salts there is a Difference, in regard some are quicker and in greater Quantity dissolved than others; for Instance, alkali Salts, common Salt, Salt-petre and Vitriol readily dissolve in Water. On the contrary, the *Arcanum duplicatum*, *Tartarus vitriolatus*, and the like neutral Salts, with more Difficulty: the former it dissolves cold, but the latter hot; and for crude Tartar the Water must be boiling hot.

11. And this Observation may be of service, when such different Salts are found lodged together in one and the same Subject and we would attempt to separate them, *e gr.* Pot-ash, as not only *Stahl*, but even *Cardilucius* and *Kunckel* have observed, is not

pur

pure alkali Salt, but holds alſo a large Proportion of a neutral Salt, reſembling *Tartarus vitriolatus*; eſpecially if it be expoſed for ſome time to the Air, a great deal of the Alkali will be changed by the univerſal Acid lodged in that Element, and be reduced to ſuch a neutral Salt. Upon diſſolving the alkali Salt with cold Water, the neutral Salt remains behind, as a whitiſh grey Slime, which elixated with boiling Water, and filtrated hot, after cooling ſhoots into a conſiderable Quantity of a neutral angular Salt, entirely different from the other Salt.

12. And yet Water imbibes a certain Quantity only of ſuch Salts as it otherwiſe readily diſſolves; *e. gr.* one Pound of Water abſorbs about ſix Ounces of common Salt; ⅛ of an Ounce of Tartar; one Ounce of *Tartarus vitriolatus*; two Ounces of Nitre, as many of Vitriol, and a greater Quantity of each as they are more or leſs pure; and what is put into the Water over and above remains undiſſolved. But it is worth remarking, that upon throwing in a different Salt from what the Water is already ſaturated withal, *e. gr.* Vitriol or Salt-petre, it ſtill abſorbs a conſiderable Portion of theſe.

13. Vinegar diſſolves all ſorts of Earths, Corals, Crabs-eyes, Mother of Pearl, and other Shells; as alſo Iron-filings, and calcined Lead and Copper. It is alſo employed in diſſolving and depurating the Gum-roſins, as Opium, Gum-ammoniac, *&c.*

14. And even other acid vegetable Juices, as thoſe of Lemons, Quinces, *&c.* ſupply the place of Vinegar; as does alſo Tartar diſſolved in hot Water, and even Wine itſelf.

15. Spirit of Wine is the beſt Solvent for Roſins; as Benjamin, Gum Sandarach, Maſtich, Camphire, *&c.* In like manner it readily abſorbs Salts impregnated with Oils, or Fats attenuated with Salts; as we ſee in Soap, which it diſſolves in a conſiderable Quantity; whereas it does not readily abſorb either Oils or Fats apart, nor pure alkali Salts.

16. And this is the Foundation of the Encheireſis for rectifying Spirit of Wine without Fire, or for its extemporaneous Dephlegmation. Thus upon throwing a dry alkali Salt, as Salt of Tartar, or Pot-aſh, into the Spirit of Wine, you ſtill ſuppoſe to hold Phlegm, ſhaking them together, and then ſetting them to ſtand for ſome time, the Phlegm with which the Spirit is ſtill charged, diſſolves the Alkali, falls to the bottom becauſe of its Weight, and

and the Spirit ſeparating therefrom, mounts up to the top, and may be gently decanted off.

17. Yet the Spirit abſorbs ſomewhat of the Alkali, as the Taſte in part ſhews, and in part is manifeſt upon rectifying the decanted Spirit by the Alembic; for in that Caſe a good deal of Salt remains behind, tho' remarkably altered in its alkaline Nature: yet this Inconvenience may be obviated, by proportioning the Quantity of Pot-aſh to that of the Phlegm, ſo as that this laſt ſhall be but juſt ſaturated therewith. In this Proceſs the Pot-aſh muſt be pretty dry; and notwithſtanding all this, the Spirit rectified in this manner continues ſtill conſiderably phlegmatic: And if you intend not the Alcaliſation of your Spirit, but its accurate Dephlegmation, rediſtilling it is abſolutely neceſſary; eſpecially if you propoſe the making ſuch Eſſences, as are to be uſed externally, as the Eſſence of Amber, *&c.* in which Caſe the ſaline alkaline Parts are of no ſervice.

18. The Spirit abſorbs a much greater Proportion of alkali Salts, if theſe are previouſly ſaturated with diſtilled Vinegar, or impregnated with diſtilled Oils, or cemented with Lime. Vid. *Præparationem Salis mirabilis*

Vateri. Tho' when the Alkali is firſt ſaturated with Vinegar, it is no longer to be called an Alkali, but a neutral Salt. Theſe Extractions, from Herbs and Roots in particular, are certainly of great Uſe in Medicine; for as their peculiar Virtue lies commonly much diſperſed among the earthy Parts; when they are preſcribed in Subſtance, the Doſe muſt be the larger, which in taking nauſeates not only the Patient, but loads and hurts the Inteſtines, becauſe of the ſuperfluous earthy Portion: But in the Form of an Extract, this Inconvenience is obviated, the Doſe ſmaller, and the Effect more immediate and ſafe. Now as theſe Reaſons gave riſe to the ſeveral Formula's of Eſſences, Extracts, Decoctions, and diſtilled Waters; in the ſame View alſo a great deal of Traſh has been introduced into the *Materia Medica*; and that only from not knowing the Mixtion of Herbs and Roots, and from not conſidering wherein the peculiar Virtue of each Species is lodged, and endeavouring the Separation of that Part. For Roots and Herbs commonly bear in their groſs woody Parts, either a reſinous, a ſulphureous, or even a ſlimy or gelatinous ſaline Subſtance, wherein their ſpecific Virtues are properly lodged: and if for each a

proper

proper Menſtruum be not employed, you miſs of your End. For Inſtance, an Extract of Fumitary, Wormwood, the leſſer Centaury, *&c.* with Water yields only a bare acid Juice; but if you would know what remains behind in the Plant, dry it gently, and extracting it with Spirit of Wine, you have an Eſſence, having the genuine Smell, Flavour and Virtue of theſe Herbs. Hence the beſt Manner of making ſuch Extracts is, if inſtead of Water, the Herbs be macerated in Wine. On the contrary, if you extract the Root of black Hellebore with Spirit of Wine, you obtain nothing at all; but with Water, all its Virtue. Hence great Regard is to be had to the Smell and Taſte of Herbs. Such as taſte ſharp and bitter, and ſmell ſtrongly reſinous, as the alexipharmic Roots and Herbs, *e. gr.* Root of Angelica, Vincetoxicum, Maſter-wort, Elecampane, *&c.* require a ſpirituous, and the other an aqueous Menſtruum; but if with ſuch a Menſtruum you would only macerate, and afterwards expreſs them, you muſt be heedful that the Evaporation be very gentle, and that the beſt Parts do not fly off.

19. Expreſſed as well as diſtilled Oils, no leſs than Spirit of Wine, diſſolve Roſins, as

Camphire, Gum Sandarach; nay also dissolve common Sulphur, which Spirit of Wine does not.

20. Urinous Spirits are not in general much employed in Solutions, tho' they sometimes dissolve better than the sharpest acid Menstruums; *e. gr.* acid Spirits dissolve not the Magisteries of the several earthy Subjects, which notwithstanding urinous Spirits do.

21. Among Metals, urinous Spirits most readily lay hold on Copper; so that this is the quickest Method of assaying false Silver, or white Copper, and discovering whether any one Mixture or Ore hold any Copper; *viz.* if the Spirit poured thereon becomes of a blue Colour. The *Tinctura Lunæ* commonly found in the Shops, is only such a Solution of the Copper, which still remains in the Silver after Cupellation, and whch could not be separated thereby: But if you further purify the Silver, the urinous Spirit will no longer take such a Tincture from it.

22. Urinous Spirits alone dissolve no Oils, or but sparingly; but when directly united in Distillation with Spirit of Wine, they dissolve in a pretty large Proportion; a Property necessary to be known, when you would make the *Salia volatilia oleosa.*

23. The

23. The Lixivia or Solutions of alkali Salts, eſpecially when they are ſharpened with Lime, diſſolve common Sulphur, Orpiment, and Antimony, not only the ſulphureous but the reguline Parts thereof, as *Borrichius* has obſerved in the *Acta Haffnienſia*, T. II. Obſ. 73. and further, both the Fat of Animals and expreſſed Oils, as may be ſeen in the Preparation of Soap; but diſtilled Oils, not without peculiar Encheireſes.

24. Acid mineral Spirits are employed in diſſolving and extracting Metals, the ſeveral earthy Subjects, Stones, and the like: Reſinous Matters, as Wax, Pitch, Turpentine and Varniſh they touch not. Hence the Workmen in etching, or engraving on Copper with Aqua fortis, firſt lay on the Plate a Ground of ſome reſinous Subſtance or other, and afterwards lay bare the Plate in all the Places into which the Aqua fortis is to eat.

25. Aqua fortis or Spirit of Nitre diſſolves Silver, but not Gold; but if you only add ſo much Sal ammoniac, or common Salt, as it can imbibe cold, it commences an Aqua regia, diſſolves Gold and precipitates the Silver. Hence they are both called *Scheide-waſſer*, Water of Separation or Depart, as they ſeparate or part Gold and Silver from each other.

If to Aqua fortis, or Spirit of Nitre, you put highly rectified Spirit of Wine; or if only the red Fumes riſing in Diſtillation be introduced into it, it then alſo diſſolves Gold.

26. Aqua fortis and Aqua regis equally diſſolve Quickſilver, tho' the former does ſo more readily than the latter; in like manner Copper and Iron, but with a violent Agitation and ſtrong Heat.

27. Aqua fortis violently ruſhes on Tin, but corrodes it only to a white Calx, and diſſolves it not without a particular Encheireſis; which notwithſtanding Aqua Regis readily does.

28. If you would diſſolve Lead, you muſt weaken or dilute your Aqua fortis with about three Parts common Water.

29. The ſame is alſo to be done to Oil of Vitriol, if you would diſſolve Iron.

30. Oil of Vitriol cannot diſſolve Copper, unleſs the Copper be either previouſly calcin'd, or otherwiſe open'd.

31. Oil of Vitriol diſſolves not Gold in the common manner, but rather precipitates it out of other Menſtruums, unleſs the Oil be, in a certain manner, previouſly prepared with the Gold; but diſſolves Silver, when boiled therewith: whence ſome Artiſts employ it in ſeparating Gold and Silver.

32. Oil

32. Oil of Vitriol does not touch Quicksilver, without previous Coction or Abstraction, and then it resolves it to a white and pretty fixt Calx, which, by pouring common Water thereon, takes a yellow Colour, and is then called mineral Turbeth.

33. Spirit of Salt, of itself, dissolves not Gold; but putting to it some Spirit of Nitre, or bare Nitre only, it readily dissolves it; neither does it dissolve Silver and Lead, but Copper, Iron and Antimony perfectly.

34. What is peculiar to this Spirit above other Menstruums is, that it renders its Solvends very fluid; so far that common Lime, which otherwise cannot be fused by the strongest Fire, becomes by its means an easily fusible Salt.

35. Amalgamation is also a Species of Solution, and holds a middle place between the humid and dry way; tho' it approaches nearer to the former than to the latter. It is true, running Mercury wets not Wood, Stones, Glass, or the Hands; yet to Metals it cleaves, as Water or aqueous Liquors do to the above-mention'd.

36. Among Metals, Mercury lays hold most readily on Gold; next to that, on Silver, Tin and Lead; but more difficultly on Copper:

per: on Iron, Biſmuth and Regulus of Antimony, not at all.

37. Indeed when theſe laſt are combined with Silver, Tin and Lead, they in appearance give Ingreſs to the Mercury; but afterwards in Digeſtion it ſtrikes them out.

38. Biſmuth imparts to the Metals, with which it is combined, a peculiar Penetrancy, ſo as in part to make them paſs thro' Leather; a thing otherwiſe not ſo eaſily procurable: But if this Amalgama be ſet at reſt for ſome Days, the Biſmuth ſpontaneouſly re-ſeparates and riſes a-top in a dry Powder; and the Metal remaining cloſely united with the Mercury, may paſs with it thro' Leather.

39. To diſſolve with Mercury or amalgamate Metals, it is proper previouſly to laminate, file them down, granulate or diſſolve them in their appropriated Menſtruums, and precipitate them with ſome other Metal, and not with Salts; for Salts attach to metallic Calx's, and hinder the Quickſilver from combining therewith; ſo that Quickſilver receives neither Silver nor Copper, precipitated with Salts; but perfectly well, when this has been thrown down with Iron, and that with Copper.

40. Amal-

40. Amalgamation, as likewiſe moſt other Solutions, is greatly promoted by external Heat.

41. To Solution in the humid Way is reducible *Deliquation*; which is when a dry Matter put in a moiſt Place relents in time, and turns to a Liquor: and this is called running *per deliquium*. This do all lixivious or alkali Salts; the *Terra foliata Tartari*, and common Salt, if previouſly calcined or melted; the *Sal-ammoniacum fixum*, Mercury-ſublimate mixed with Tin, Iron, or Sal-ammoniac, Butter of Antimony, Vitriol of Iron, and generally all metallic and mineral Extractions made with Spirit of Salt.

42. This Deliqueſcence anſwers better in Summer, in the dry Air of a ſhady Place, or in a dry Cellar, than in too damp a Place; and is greatly promoted by powdering the Matter fine, ſpreading it abroad, and thus ſuffering it to ſtand.

43. Several Authors, eſpecially among the Ancients, have obſerved, that this Manner of Solution, *viz.* when any Matter diſſolves ſlowly of itſelf, is far preferable to the other Methods of pouring Water or other Liquors thereto, and hurrying the Solution; in regard the Salts, in the former Manner, repeatedly

run

run, and re-coagulated, gain an uncommon Degree of Fluidity and Penetrancy, not procurable the other way: As Salt of Tartar and fix'd Nitre become in this manner ſo fluid, that put in a Crucible on the Fire, they immediately paſs through it, without leaving the leaſt Trace behind. Hence *Iſaac Hollandus*'s Advice appears not ſo impracticable, when he ſays Salt of Tartar muſt be purified ſo long, till it become an Oil, no longer reducible to a Salt, by expoſing it either to Cold or Heat.

44. Solution in the dry Way is, when, for Inſtance, Salt of Tartar, Pot-aſh, Nitre, *&c.* are melted, and Antimony, Sulphur, Arſenic, pounded Flints, Glaſs, *&c.* are thrown into the Salts in Flux; the Salts ruſh on theſe Matters with a violent heaving and boiling, and imbibe them in ſuch ſort, that when the Salts are afterwards ſuffered to relent in the Air, or diſſolve in warm Water, a good deal paſſes through the Strainer.

45. In particular, an Alcali, combined in this manner with a Sulphur, has a great Power of fluxing Metals, and even Gold. *Vid. Stalii anweiſung zur Metallurgie in der dabey befindlichen Einleitung zur grund-mixtion*, p.406. §. 36. *Stahl*'s Elements of Metallurgy in the annexed

annexed Introduction to fundamental Mixtion, *p.* 406. §. 36.

46. But otherwiſe it is all one, whether you firſt melt the Salt, and then throw into it what you intend to diſſolve; or whether you firſt flux the Matter, and then throw the Salt thereon; or whether you mix and flux them together. The firſt Method ſuits beſt with volatile Matters, as Sulphur and Arſenic; the ſecond, with fix'd and fuſible Subjects, as Metals, and in ſome meaſure Regulus of Antimony; the laſt Method, with fix'd and unfuſible Subjects, as Stones, Glaſs, *&c.*

47. Under this Head we are alſo to reckon ſuch Diſſolutions, as happen when metallic Calx's are put into molten Glaſs, or are melted with a vitrifiable Maſs; and ſo diſſolved by the Glaſs, as that this latter ſhall be tinged throughout; as from Gold a Ruby-red. Vid. *Orſchalck's Sol ſine veſte*; from Copper, a Sea-green Glaſs; from Copper and Iron, a Graſs-green; from Tin, a white Glaſs; from Lead, a yellow; and from Cobalt, an Azure-glaſs; ſo as thus to diſcover the Contents of any Ore. *Vid. Glauber. Furn. Philoſoph.* P. IV. p. 18, 19. *It. Kunckel. Ars vitriar.*

CHAP. II.

Coagulation and Precipitation.

1. IT is not without Reason we subjoin Coagulation and Precipitation to Extraction and Solution; or rather set them in Opposition; as they are Counterparts, to each other: For Coagulation restores to a dry Consistence, what Solution had made pass from a dry Form into a State of Fluidity; and what Solution or Extraction had united with the Menstruum, is by Precipitation re-separated therefrom.

2. Inspissation, Evaporation, Abstraction and Crystallisation are also different Degrees or Species of Coagulation.

3. For when either vegetable or animal Extracts and Solutions are not reduced to a dry Powder, a thing impracticable without the Loss of their best Virtues, but only to the Consistence of a thick Juice, this is called Inspissation; and such inspissated Juices eminently *extracts* The more gentle the Evaporation or Inspissation, the more the Extracts

tracts retain of the Virtues of their Simples: But the ſtronger the Fire, the more the finer volatile Parts evaporate; ſo as thereby Aſarum, Tobacco, Hellebore and Opium ſhall be almoſt diveſted of their emetic and narcotic Virtues.

4. When this Separation of the Menſtruum is performed in an open Veſſel, ſo that the Menſtruum flies off and ſpends itſelf in Vapours, it is called Evaporation; but if in cloſe Veſſels, that the Menſtruum be again recover'd, Abſtraction.

5. Cryſtalliſation has only place with regard to diſſolved Salts; for ſince Water, as we ſaid above, can imbibe and hold a certain Proportion only of Salts, and hot Water diſſolve more than cold; it happens, that when in Evaporation the diſſolved Salts are again deprived of their Humidity, they reaſſume their former dry and hard Conſiſtence, ſeparate from the Water; and that at firſt on the Surface, as there the Humidity flies off more copiouſly, and form a ſaline Cruſt or Skin. Now if the Solution be ſet to cool and ſtand for ſome time, more ſaline Particles ſeparate from the cooling Water; and as in the ſuperfluous Moiſture they have ſtill room to move, they ſettle orderly on each other, on the Sides

and

and Bottom of the Vessel, and thus acquire a certain Figure, which in some Salts, as Saltpetre, nearly resembles Rock-Crystal; hence the entire Process is called *Crystallisation:* But on the contrary, when the dissolved Salts are violently boiled in, there only arise irregular saline Lumps or Masses.

6. Crystallisation is not only employed for purifying Salts, but also for separating them from one another; for Instance, genuine inflammable Nitre, with its acidish Salt, is separated from the alkali Salt of *Nitrum Antimoniatum*, or the common Saltpetre from the cubical fossil Salt it holds.

7. For in the Crystallisation of Salts we find a twofold Distinction; *viz.* one Species shooting sooner than another, and also into a different Figure; for Instance, the neutral Salts, as *Tartarus vitriolatus*, the *Arcanum duplicatum*, and the *Sal salsum* from Pot-ash, shoot much sooner than Alkali's, which *per se* are hardly or ever brought to crystallise: Saltpetre, Vitriol and Alum more readily than common Salt; which last, without a peculiar Encheiresis, is scarce ever disposed to shoot. Further, as to the different Figures of Salts; Saltpetre shoots into oblong Prisms, and common Salt into Cubes, Vitriol and Alum into polygonal Crystals.

8. To

8. To precipitate any thing, is no other than ſeparating it, by the Addition of ſome other thing, from the Menſtruum, wherewith it is diſſolved or extracted, ſo as to make it fall down to the bottom.

9. And as Solutions, as we ſaid above, are not only accompliſhed by means of peculiar Liquors and Menſtruums, but alſo by dry Salts fuſed in the Fire; ſo may Precipitation be performed not only in the humid, but in the dry way too.

10. For inſtance; when Lead, Biſmuth, or Regulus of Antimony, are corroded by Salt-petre or alkali Salts, and in ſome meaſure diſſolved, ſo as together with the Salts to conſtitute one uniform Maſs; and you put ſome Iron-filings, or only ſome Charcoal-duſt thereto, and fuſe them along therewith, the metallic Matter re-ſeparates from the Salts, and collects at the bottom of the Crucible in its original State; and hence ſuch Additions as ſeparate Metals from their Sulphur, and Flux-powders, are called Precipitants.

11. The following is given as a general Rule in Precipitation; *viz.* that each Matter is precipitated by its Oppoſite, *i. e.* an alkaline Solution by means of Acids, and *vice versâ*; but it does not always hold: For

often Alkali's and Acids mutually precipitate each other, *e. gr.* Aqua fortis precipitates Butter of Antimony; Spirit of Salt, the Silver and Lead dissolved in Aqua fortis; Spirit of Vitriol, the Solutions of earthy Matters made in Spirit of Salt, as we see in the Preparation of the *Magisterium Antepilepticum Michaelis*; Spirit of Urine throws down the Sulphur of Antimony, which has been extracted with an Alkali. Sometimes one Metal throws down another; thus Mercury precipitates Silver dissolved in Aqua fortis; Silver, Lead; Lead, Copper; Copper, Iron; and Iron, Crabs-eyes: Oftentimes bare Water alone precipitates, as we see in the Preparation of *Mercurius Vitæ*, and the *Lac cosmeticum*, tho' neither Acid nor Alkali be found therein.

12. But we are well to observe, that tho' a Solution may be precipitated by different Matters, yet it proves not all one, which Precipitant you employ; for the Precipitate acquires different Properties, according to the Difference of the Precipitant.

13. For Instance: Gold dissolved in Aqua regis, and precipitated with an Alkali or an urinous Spirit, yields an *Aurum fulminans*; but if you take a Solution of Vitriol to precipitate withal, you have a fine yellow Gold

Calx

Calx without any fulminating Quality; if you precipitate with a Solution of Mercury-precipitate, or Verdigreaſe; by pouring on much Water, you procure a ſparkling gold Calx, wherewithal to paint and write. *Vid. Caſſius de Auro*, p. 97. And according to *Glauber*, Tartar, nay even Rheniſh, *Franconian* and *Miſnian* Wines have the ſame Effect. If you pour on a Solution of Gold made with Aqua regis, and diluted with much common Water, ſome diſſolved Tin; or if you only put into it clean Tin-plates, the Gold ſoon falls to the Bottom in a purple-coloured Powder; and this Gold-calx is the fitteſt for making the ruby-red Glaſs, or ruby-flux, which has been kept ſo great a Secret. *Vid. Sol. ſine veſte*, p. 27, and 84.

14. If with Spirit of Salt, or Salt-water, you precipitate Silver diſſolved in Aqua fortis, the precipitated Silver-calx becomes highly volatile, and ſo eaſily fuſible, as in the ſofteſt Heat to melt to a ſemi-tranſparent Maſs, almoſt reſembling Horn, whence its Name, *Luna cornua*; the ſame thing alſo befals Lead diſſolved in Aqua fortis, and precipitated in that manner. But if you precipitate with Oil of Vitriol, or with an Alkali, the precipitated Calx is far from being ſo volatile and

fuſible. Yet the Salts employed in the Precipitation attach thereto ſo ſtrongly, that running Mercury difficultly receives this Calx, or amalgamates therewith; which yet readily happens, if the Silver be thrown down out of the Aqua fortis with Copper, or running Mercury.

15. Mercury diſſolved in Aqua fortis, and precipitated with Spirit of Salt, or with Salt-water, alſo yields a white Calx, which is therefore called white Mercury precipitate, or *Mercurius coſmeticus.* If you employ a fix'd Alkali, you have a dark-red Precipitate; if Copper or Iron, your Mercury is revived.

16. Further, there is much in obſerving the due Proportion; *e. gr.* if on a Solution of Copper made with Aqua fortis, I drop Spirit of Sal-ammoniac or of Urine; at firſt indeed a good deal falls down, but if I pour more Spirit of Urine thereon, ſo as that it predominates, it re-diſſolves the Precipitate; and the entire Solution, which before was only green, gains a beautiful Sky-colour. On the contrary, when on a Solution of Silver in Aqua fortis not highly ſaturated, a little of the Spirit of Sal-ammoniac, or urinous Spirit is dropt, there precipitates nothing; but if the Solution be deeply charged, ſome

of

of the Silver falls down: And if you go on with dropping in the urinous Spirit, the whole will be re-diſſolved. And this is alſo the Reaſon, why it is not all one, whether, *e. gr.* I pour a Solution of Iron in Aqua fortis on an alkaline Solution, or this on that: ſince in the firſt Caſe, both Solutions incorporate without Precipitation; and in the latter, precipitate each other: but this may be ſoon remedied by pouring on more Alkali ſo long till it predominate; for here the Matter principally turns on the different Proportions: And thus two oppoſite Solutions may be incorporated or combined, if we only mind the proper Proportion.

17. In ſeveral Precipitations there is alſo a remarkable Difference obſervable between what falls down firſt, and what laſt; *e. gr.* if you precipitate a Solution of Vitriol with an Alkali; or a Lixivium impregnated with Sulphur of Antimony, by an Acid; what falls down firſt is much darker and groſſer than what laſt, which is much finer and lighter in Colour.

18. It is worth obſerving, that moſt Precipitates do not re-diſſolve in their former Menſtruums: Some again re-diſſolve, but are not again precipitated by the former Pre-

cipitant: *e. gr.* If you throw down Mercury-precipitate, which is no other than a Mercury dissolved in concentrated Spirit of Salt, with Oil of Tartar *per deliquium*, it falls down a dark-red Powder. This Powder indeed may be again dissolved in a strong Spirit of Salt, but not again precipitated with Oil of Tartar *per deliquium*. Vid. *Stahl*'s *Anweisung zur Metallurgie in der dabey befindlichen einleitung zur grund-mixtion*, p. 367. §. 154. *Stahl*'s Elements of Metallurgy in the annexed Introduction to fundamental Mixtion, *p.* 367. §. 154.

19. We shall here only add this one thing, *viz.* that in Precipitations we are not only to preserve and examine the Precipitates, but the remaining Liquor too: For in evaporating, it generally yields much Salt, which is sometimes of greater Value than the Precipitate itself; *e. gr.* on precipitating alkaline Solutions with Oil or Spirit of Vitriol, you procure a *Tartarus vitriolatus*; if with Spirit of Nitre or Aqua fortis, a *Nitrum regeneratum*; if with distilled Vinegar, a Salt like the *Arcanum Tartari*. Upon precipitating any Solution made in Oil of Vitriol, Spirit of Salt, or Spirit of Nitre, with Spirit of Urine, we obtain a subtile Sal-ammoniac; and when

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the Evaporation, or even the Precipitation, is performed in close Vessels, as a Cucurbit furnished with its Head and Receiver, we generally procure a fine Spirit, which most People, as it is not acid, look upon as an useless Phlegm, and thus disregard it: yet if we take the trouble to precipitate with an Alkali any Solution made in Spirit of Nitre or Aqua fortis, and gently draw off the Phlegm in a Cucurbit, a sweet Spirit, like Spirit of Wine, comes over in fatty Veins.

CHAP. III.

Digestion, Maceration, Fermentation, and Distillation.

1. SOLUTIONS and Extractions are not a little promoted by Digestion and Maceration; and both these, together with Fermentation, must generally precede Distillation; and hence it will not be unprofitable briefly to touch on them in this place.

2. To digest, or set any thing in Digestion, is to expose it for some time to a moderate Heat; to the end that the Menstruum

may the better imbibe the Subject to be diſſolved or extracted, open it, and incorporate therewith.

3. For this reaſon the Heat ſhould never be ſo ſtrong and violent, as to make the Matter in Digeſtion boil; unleſs you digeſt in Cucurbits furniſh'd with their Heads and Receivers, otherwiſe you loſe the beſt Parts, or endanger your Glaſſes.

4. Maceration is often performed without Fire in a temperate Place, as a Stove or Chamber, where the cold Air has no Acceſs; and is generally employed for ſuch Vegetables, as we would by this ſoaking render fitter for Diſtillation.

5. Fermentation, according to ſome Authors, includes alſo Putrefaction, or rather is the firſt Degree or Step towards it, and denotes a ſoft and leiſurely Diſſolution of a Thing; whereby the included Spirit is, by means of Fire, and the Warmth of the Air, brought into Motion, and diſengaged from the earthy and viſcid Parts wherein it is entangled; ſo as now not only to diſcover itſelf by the Smell and Taſte, but alſo in a ſomewhat ſtronger Degree of Heat to be ſeparated by Diſtillation.

6. And

6. And according to the different Degree of Fermentation, or Difference of the Subject; now an inflammable, again an acid, and then an urinous Spirit is produced, of which before the Fermentation no Trace could be diſcover'd in the Subject.

7. And tho' Muſt, Honey and unfermented Wort be boiled or evaporated ever ſo much, they yield no Spirit, but an inſipid Water only. On the contrary, after Fermentation, both Wine, Mead and Beer give forth an ardent Spirit; if the Fermentation be continued further, ſo as that they become a Vinegar, in the Diſtillation you procure no ardent Spirit, but an acid one. Thus Urine too, if inſpiſſated or evaporated freſh, yields nothing but a weak Phlegm; but if it has ſtood for ſome Weeks in a temperate Place, and is thus brought to ferment and putrefy; in a ſoft Bath-heat there comes over a highly volatile ſaline Spirit, from which the other urinous Spirits take their Denomination.

8. For further Information on this Head, you may conſult *Willis* and *Kergerus de fermentatione*; alſo *Stahl*'s *Zymotechnia fundamentalis*, and *Becher*'s *Phyſ. ſubterran.* §. v. c. 2.

9. To

9. To distil, literally denotes a trickling down in Drops; and in this Sense it includes Filtration also: As it was no unusual thing with the Ancients, to order, when any thing was to be filtrated, the distilling of it thro' the Strainer; tho' they also used a quite different Method of Filtration than we do, and which rather deserves the Name of Distillation. Vid. *Geber*. Lib. I. P. IV. c. 49. p. 97.

10. But Distillation properly denotes the driving over, by means of Heat, the aqueous, oily and spirituous volatile Parts from the more gross, earthy and fix'd, in the Form of a Fume or Vapour; so as afterwards to recondense and collect together into Drops in the somewhat cooler Head or Receiver.

11. Now this may be done three several ways: 1. *Per Descensum*. 2. *Ad Latus*, or by the Retort. 3. *Per Ascensum*, or by the Alembic.

12. Distillation *per Descensum* is performed as follows: Two earthen Pots, that exactly answer, are whelmed one over the other, and a perforated Plate or earthen Colander placed between them; the Subject is put into the upper Pot, and the Junctures being well luted, the lower Pot is set deep in the Earth, and then the upper is beset round with

with Fire, and at laſt quite buried in live Coals. Some recommend this Method of Diſtillation for Subjects that difficultly, or do not at all riſe upwards; for Inſtance, Oil of Vitriol, in order to have a large Quantity of it, Mercury forced out of Antimony; but generally the Diſtillation *ad Latus*, or by the Retort, is uſed for this purpoſe.

13. A Species of Diſtillation by Deſcent, is that uſed for burning out, or procuring Tar and Pitch from the Pine; and alſo that other employed by good Houſewives in diſtilling their Roſe-water by means of an earthen Pan.

14. There is further this Difference in Diſtillations, *viz.* that they are either performed in a naked Fire, where the Flame is in immediate Contact with the diſtilling Veſſel; or where there is an interpoſing Medium, as Water, Aſhes, Sand, Iron-filings, *&c.* which firſt receive the Heat from the Fire, and afterwards communicate it to the Veſſel.

15. The interpoſing Matters moſt in uſe are Water and Sand: The firſt is applied in different Manners; thus, either the Veſſel is expoſed to its Vapour, and this is called *Balneum Vaporis*, or *Roris*; or it is plunged in the Water, and called *Balneum Immerſionis*, or *Maris*,

Maris, and corruptedly *Balneum Mariæ*: And in this last Case, the Glass is loaded with a Ring of Lead, that it may sink, and not rise up out of the Water; and sometimes chopt Straw or Chips are put into the Water; partly for the Vessel to stand the firmer, and partly to prevent the too quick Evaporation of the Water.

16. We commonly use dry Sand; some however moisten it with Water, to prevent the Matter to be distill'd from burning to; but when we have any such Suspicion, it is better to distil by a Bath-heat.

17. In general, the Difference between the above-mention'd Methods of distilling, and the Choice of that which is most proper for each Subject, depend on the following Particulars: 1. Such Subjects as are apt to rise readily, or froth and boil over, distil best *per Ascensum*; i. e. by the Cucurbit or Alembic; but such as rise with Difficulty, are best forced off by Descent, or by the Retort. 2. Such Matters as require a strong Heat, must be urged in a naked Fire. 3. Such Subjects as are apt to burn to, and acquire a nauseous Smell and Taste, as almost all vegetable and animal Subjects do, when drawn off in Sand to Dryness, must be distilled by a Bath-heat.

heat. 4. Sand gives a greater Degree of Heat than Aſhes, but thereby Glaſs-veſſels more readily burſt: and conſequently when you have this to fear, and you would draw off to Dryneſs any fluid Matter, but particularly ſaline Liquors, you may employ Aſhes or Lime that has relented in the Air; or when you would not have too great a Degree of Heat, a Bath-heat.

18. Thus acid mineral Spirits, Spirit of Nitre or Aqua fortis, Spirit and Oil of Vitriol, the Spirits from Guiaiac, Oak, Tartar, Soot, Hartſhorn, *&c.* are for the moſt part diſtilled in a naked Fire: Butter and Cinnabar of Antimony, corroſive and ſweet Mercury-ſublimate, the Liquor C. C. Succinatus, *&c.* are generally diſtilled, ſublimed and rectified in Sand: The odoriferous Waters from Flowers are diſtilled *in Balneo vaporoſo:* Urinous and inflammable Spirits are diſtilled and rectified *in Balneo mariæ.* Yet often the one Method may be ſubſtituted for the other; as the Spirits from Woods, Tartar, Hartſhorn, and alſo thoſe of Nitre and Salt may well be forced off in Sand; Spirit of Vitriol alone requires almoſt indiſpenſibly a naked Fire. Urinous and inflammable Spirits and diſtilled Oils may be alſo abſtracted and rectified in Sand.

19. We

19. We had almost forgot to mention the *Venter Equinus*, or Horse-dung, so much cried up among the Ancients; yet for it you may substitute the Mark or Husks of Grapes, Moss, wet Grass and Hay, after heating upon each other. And indeed for the soft opening of many things, an Operation to be promoted by a constant Digestion and leisurely Putrefaction, the Warmth of Dung has something in it peculiar, as it approaches nearest to the vital Heat; only you must shift your Dung every eight or ten Days; and if you have not the Opportunity of so doing, you may use instead of it the *Balneum vaporosum*.

20. As to the Vessels employed in Distillation, we are to observe that those of Glass are certainly the best sort: But when at the last such a Degree of Fire must be given, as might otherwise melt the Glass, earthen Vessels are fittest; burnt pretty hard to obviate the Escape of the Spirits, as those of *Waldenburg* are; and that they may not so readily crack, they are first to be well coated over with a good Lute: the same Precaution is also necessary for Glass-vessels, not only in a naked Fire, but when exposed to a strong continued Heat in Sand. When a large

Quantity

Quantity of fluid Matters are to be diſtilled, it is generally done in a tinned Copper-Alembic; and ſuch a Veſſel anſwers pretty well for Brandies, and moſt diſtilled Waters: but if there be any Acid therein, the Diſtillation, or at leaſt the Rectification ſhould be performed in Glaſs-bodies. Iron-veſſels are not often employed, unleſs for diſtilling Aqua fortis, or for the Revivification of Mercury, and the forcing it from its Ore: And this way the trouble of purifying the Aqua fortis by Precipitation for the Depart is ſaved.

CHAP. IV.

Rectification, Dephlegmation, and Concentration.

1. RectIfication is a repeated Diſtillation, whereby the Subject is freed either from its ſuperfluous Phlegm, or earthy Impurities, and thereby render'd clearer, more pleaſant and ſtrong.

2. And thus Rectification differs not greatly from Dephlegmation, only that it is ſomewhat more extenſive, and includes the Separation of the earthy Parts; whereas Dephlegmation

mation has for its Object only the Separation of the useless and superfluous Phlegm.

3. To do these things in a proper manner, we must, in the first place, cast about for some Marks or Characters, whereby to distinguish the useless Phlegm from the other spirituous and efficacious Parts, and then duly advert, in what Case the Phlegm comes over first, and in what last.

4. As to the first, the Taste is usually made the Touch-stone; and what consequently has no peculiar Taste, is looked upon as an inefficacious and useless Phlegm; yet this Proof does not always hold, as *Cassius* has shewn *de Auro*, Cap. X. p. 109. of the Phlegm of Aqua fortis; and *Becher* in his *Phys. subterr.* L. I. c. 3. §. 11. p. 78. of an insipid Water distilled from a certain sort of Clay: Besides, their not congealing in the keenest Winter Cold, which is otherwise peculiar to Water, affords a sufficient Argument, that such insipid Phlegms are something more than common Water. We must therefore call in other distinguishing Marks; for Instance, in distilling and rectifying inflammable Spirits, so long as you observe fatty Veins in the Still-head, what comes over is in no wise an useless Phlegm, tho' insipid:

And

and what in diſtilling mineral Salts heats the Receiver ſo much, and in rectifying yields very ſmall Drops, is alſo no jejune, feeble Phlegm, but a highly ſubtile Spirit.

5. As to the ſecond thing, the Order in which the ſeveral Parts riſe; in diſtilling for urinous and inflammable Spirits, as alſo for odoriferous Oils and Waters, the nobleſt and beſt Parts uſually come over firſt; in diſtilling for Vinegar, Aqua fortis, Spirit of Salt and Vitriol, the ſtrongeſt acid Spirits riſe laſt: I ſay, the acid Spirits; for as we already hinted, there comes firſt of all a ſubtile and penetrating Spirit, but not ſenſibly acid, and therefore generally thrown away as an uſeleſs Phlegm; as *Paracelſus Oper. T.* 1. *p.* 879. has remarked and corrected this Miſtake with reſpect to Oil of Vitriol: And therefore in rectifying theſe Spirits we ſhould obſerve this Order; firſt, receive apart the volatile Spirit, then throw away the intermediate Phlegm, and at laſt force over the acid Spirit. Yet as to Spirit of Vitriol, we are to obſerve, that all of it comes not over the Helm, but a good deal of a thick and heavy Liquor remains behind, therefore called Oil of Vitriol; and which muſt be rectified by the Retort, ſet either in *Capella vacua*, or

the Neck buried deep in Sand, and placed hanging or inclining, in regard it otherwiſe unavoidably burſts.

6. In rectifying Spirit of Wine we are to obſerve, that it is done with or without Addition; with Addition, as either in drawing it off from Salt of Tartar, Pot-aſh, and unſlack'd Lime; that theſe Matters, which are otherwiſe great Abſorbents of Humidity, may the better keep back the Phlegm; or putting other Things into it, to give it a finer Odour and Flavour. Thus ſome have the Art of communicating to common Malt-Spirits, after Rectification from Lees of Wine, the Smell and Taſte of a Rheniſh Brandy. Common rectified Brandy has a fine Odour from Amber, Maſtich, Benjamin, Aloes-wood, and other reſinous Matters, when drawn from them; with the Addition of ſome Salt of Tartar, or pure Pot-aſh. It is a very good way to rectify Spirit of Wine upon the Simple, from which we would afterwards extract with it an Eſſence or Tincture.

7. And yet theſe different Methods are by no means to be confounded, but the moſt proper for the preſent Purpoſe to be pitch'd on; for Example, Spirit of Wine drawn off an alkali Salt is not near ſo ſtrong and burning

ing in Taſte as when rectified *per ſe*; wherefore it anſwers not ſo well for ſuch common Aqua Vitæ as we would have very ſtrong; on the contrary, beſt of all for the Preparation of Medicines, or for external chirurgical Applications; yet not for vulnerary Eſſences, to be poured into Wounds; on which account alſo the common Eſſence of Amber cannot be employ'd. Spirit of Wine rectified without Addition anſwers beſt for extracting vegetable Purgatives; but if it be impregnated with an Alkali, eſpecially if extemporaneouſly dephlegmated, as we mentioned above, by putting Pot-aſh into it, and only decanting it off, without once rectifying, it deprives the ſtrongeſt Purgatives, as Jalap and Coloquintida, of all their cathartic Virtue.

8. In rectifying Vinegar we alſo ſometimes add ſome common Salt, as it is obſerv'd to be conſiderably ſtrengthen'd and ſharpen'd thereby, and by this means the ſooner and better to lay hold on Glaſs of Antimony, or other Things you would extract therewith, than if it were rectified *per ſe*; but you muſt put no more Salt therein than what the Vinegar fully diſſolves, for that is the true Proportion.

9. Concentration is a Species of Dephlegmation, and principally performed three ſe-

veral ways. 1. By Coagulation. 2. Styptic Earths. 3. Alkali Salts, which imbibe the acid Spirits, and after ſeparating the Phlegm, let go the Spirits by a ſtrong Fire, or by means of Oil of Vitriol.

10. Concentration by freezing is deſcribed by *Stahl* in his *Obſervationes Chymico-Phyſicæ* for the Month of *October*; and he gives Inſtances in Wine, Beer, Vinegar, Urine, and ſalt Water; *e. gr.* Take a Quantity of the Liquor you would concentrate, as about two Meaſures, put it in Winter Weather in a Place where it may freeze, and let it ſtand for a Night, or in a keen Froſt for a few Hours only, that about a Third or Fourth may congeal; and thus the ſuperfluous Water or Phlegm is froze, and the ſtrongeſt and beſt Parts amaſs together in the Center, and are drawn off by perforating the Ice; and this Liquor may be again ſet to congeal once or more times, the oftner the better; and thus from a poor *Thuringa* Wine you procure a ſtrong ſort, reſembling Sack in Odour, and in part in Flavour, and which keeps much better than the beſt Wine. And the Beer concentrated in this manner ſurpaſſes the double *Brunſwick* Mum; as may be ſeen at large in the above cited Place.

11. The

11. The ſecond Method of Concentration is deſcribed by *Glauber* in his firſt Century, and chiefly applied to mineral acid Spirits; for upon diſſolving Iron, Calamy, Zink, *&c.* in a Spirit of Salt or Nitre, and diſtilling the Solution in Sand from a glaſs Retort, above half the weak Phlegm goes over, but all the acid Spirit remains behind in the Iron, Calamy, or Zink, till at laſt the Retort begins to glow, when at length the corroſive Spirits themſelves come over in form of a ponderous Fume; and then the Receiver is to be ſhifted, and this concentrated Spirit received apart, which is certainly much ſtronger for Solutions, Fixations, and other Operations, than it was before, but keeps not well, and in pouring out is apt to evaporate or fume away.

12. The third Method has hitherto only been employed on diſtilled Vinegar, yet doubtleſs it might be alſo extended to other acid Spirits; the way is to ſaturate Salt of Tartar, or other pure alkali Salt, with diſtilled Wine-Vinegar, in the manner we make the *Terra foliata tartari.* This Alkali charged with the Vinegar is put into a glaſs Retort, along with its Weight of Oil of Vitriol dropt thereon, or calcin'd Alum, or Vitriol

calcin'd, the Retort put in a Sand-heat, and by the ſlighteſt degree of Heat there riſes a highly concentrated Spirit of Vinegar, not obtainable by any other Method; the remaining Salt gives a *tartarus vitriolatus*. The reaſon of the Proceſs is, that the Salt of Tartar, or the Pot-aſh, abſorbs the diſtilled Vinegar, the bare inſipid Phlegm going off in Vapour; and this is the Acid concentrated and ſet free from its Phlegm. Now upon adding the Acid of Vitriol, this, as being a ſtronger Acid than Vinegar, lays hold on the Alkali, and again diſengages it from the more ſubtile Acid, the Vinegar; ſo that the Acid of Wine is again ſet free, and comes over in a concentrated Form. But the reaſon why the Acid of Wine is ſeparable, and remains not blended with that of Vitriol, is, that the Acid of Vitriol holds diſſolved in itſelf a groſſer Earth than the Vinegar, and conſequently of a different Mixtion from the Vinegar; whence they cannot radically enter into each other, eſpecially as the Earth of the Alkali ſtands in the next degree with the Oil, and thus more readily cleaves thereto; as it alſo very firmly adheres to this Earth, and will not ſuffer itſelf eaſily to be ſeparated therefrom. And this too is the reaſon why

in

in diſtilling Aqua fortis or Spirit of Nitre we add Bole, Vitriol, or Oil of Vitriol, without which little or no Spirit is procurable.

CHAP. V.

Sublimation, Volatiliſation, and Fixation.

1. WHAT Diſtillation is in aqueous and humid Liquors, that Sublimation is in dry Subjects, *viz.* when any thing is raiſed upwards by the Force of the Fire in form of a Fume or Vapour, yet condenſing not into Drops, but ſettling as a Meal, Flour, or hard Cruſt, in the Neck of the Cucurbit, or in the Helm, or in appropriated ſubliming Pots, this we call Sublimation; what ſettles as a porous, looſe Powder, is called Flowers; what, as a firm and compact Body, a Sublimate.

2. Sublimation is twofold, *viz.* according as the Subject to be ſublimed is of itſelf volatile, or made ſo by the Addition of other Matters.

3. To the firſt Claſs belong Antimony, Arſenic, Sulphur, Sal-ammoniac; and above

all, Quickſilver, Cinnabar prepared from it, corroſive Mercury ſublimate, and *Mercurius dulcis.*

4. Now as theſe laſt are the moſt uſed in Medicine, we ſhall give them as an Inſtance of Sublimation. Mercury-ſublimate riſes the readieſt and the higheſt, Cinnabar the moſt difficultly, and *Mercurius dulcis* in a mean degree between the two; and accordingly the Veſſels and the Regimen of the Fire are to be determin'd. Mercury-ſublimate may be raiſed in glaſs Bodies in a Sand-heat; but Cinnabar requires almoſt a naked Fire, or to be ſublimed by a conſiderable degree of Fire in ſmall Bodies ſet in Crucibles; the Sublimation of *Mercurius dulcis* may be done both ways.

5. In ſubliming *Mercurius dulcis* there generally riſes much running Mercury, which mixes with the *Mercurius dulcis*, and gives it an opake grey Hue; to obviate this, the Fire is not to be hurry'd, and then the crude Mercury riſes firſt, and ſettles in the Neck of the Glaſs, next above the Sand; upon obſerving which, the Sand may be removed two Fingers Breadth, and the *Mercurius dulcis*, which riſes after the crude Mercury, finds room where to fix; otherwiſe it ſettles on the crude

crude Mercury that rose first, and so it becomes tinged grey; yet this does it no great Harm, and it may be remedy'd, if over-look'd at first, by a second Sublimation; but *Mercurius dulcis* must not be often sublimed, as thereby it loses of its cathartic and diaphoretic Virtues.

6. In subliming Cinnabar on the contrary, if only the Mercury be first well incorporated with the Sulphur, nothing is to be apprehended from the Violence of the Fire; but the stronger it is, the quicker the Cinnabar rises, and the more beautiful its Colour.

7. To the second Class belong all such Subjects as are of themselves fix'd, but which being mix'd with other volatile Matters, afterwards ascend along with them either totally or in part; and this therefore may not improperly be called a Volatilisation.

8. Tho' almost all Subjects may thus be volatilised, nay, even Gold itself, as *Cassius De Auro*, p. 107. testifies, be sublim'd into Purple Flowers; yet the Sublimation of Hæmatites, Iron, and the *Caput mortuum* of Vitriol is the most usual sort; the subliming of Tin and Copper, Corals and Granates, in the manner mentioned, being a thing not so common.

9. Sal

9. Sal Ammoniac is what is commonly uſed for ſubliming the above mention'd Subjects; and that either the common ſort prepar'd from Urine, Soot, and Sea-ſalt; or after *Glauber*, that from Oil of Vitriol and Spirit of Wine, which is a good deal ſharper and ſtronger; yet in many Caſes Mercury-ſublimate, nay, even common Sulphur or Arſenic, may be employ'd for this End: As *Baſil Valentine* in his *Triumphal Chariot of Antimony*, p. 420. teaches how to make a ſparkling red Sublimate, on a Footing equal with the beſt Ruby, from Antimony, Arſenic, Cinnabar, and *Crocus Martis*.

10. It is worth obſerving, that upon reſubliming or rectifying ſuch Sublimates, there generally remains behind a good Proportion of them in a fix'd State; and then this is a Species of Fixation.

11. Fixation is alſo twofold; either as Subjects, which were before volatile, may become totally fix'd, and be made to endure the Fire; or as they may abide a more conſiderable degree of Heat than they could before, tho' at laſt in a ſtrong Fire they too aſcend or evaporate; the former we may call a plenary, the latter a gradual Fixation.

12. Thus

12. Thus almoſt all Precipitations of Mercury are gradual Fixations only; for tho' mineral Turbeth, or Mercury fix'd with Oil of Vitriol, can, e'er it riſes, ſtand a degree of Fire that melts Glaſs, yet it not only fumes away in a naked Fire, but in earthen Retorts or Bodies may be forc'd off totally as a white Sublimate. Much the ſame is it with the *Arcanum Corallinum*, or the red Precipitate made with Aqua fortis. *Muſitanus*'s *Mercurius diaphoreticus* comes ſomewhat nearer to a compleat Fixation, tho' what remains fix'd thereof, is owing more to the Butter of Antimony uſed therein, than to the Mercury.

13. So that among all the Operations we know of, this affords the clereſt Inſtance, how a highly volatile Subſtance may again be render'd fix'd in the Fire, and bear Ignition and Melting, *viz.* by pouring on Butter of Antimony three Parts Aqua fortis or Spirit of Nitre, yet heedfully, as it is apt to conceive a violent Incaleſcence; drawing off again the Spirit of Nitre in a Sand-heat, and repeating this ſeveral times, always taking freſh Spirit of Nitre thereto, thus it not only acquires a conſiderable degree of Fixedneſs, but alſo inſtead of its former emetic, a diaphoretic

retic Quality, and is hence called mineral Bezoar.

14. *Balduin*'s Phoſphorus, fix'd Sal-ammoniac, and *nitrum regeneratum*, furniſh an Inſtance of a very quick, yet laſting degree of Fixedneſs; as in the firſt, the Spirit of Nitre is fixed and connected with Chalk; in the ſecond, with Lime; in the third, with Salt of Tartar or Pot-aſh, in ſuch manner as to endure Ignition and Melting; whereas before it would evaporate in a moderate Heat.

CHAP. VI.

Calcination, Reverberation, Detonation, Vitrification, and Cupellation.

1. TO calcine, properly denotes the changing by means of Fire a firm and compact Body into a porous looſe Powder, Calx, or Lime; and this ſometimes happening by means of ſharp ſaline Menſtruums, is therefore analogically called alſo a Calcination.

2. When the Flame of a Fire is employ'd in Calcination, and the ſame ſo directed as to play

play all over the Matter to be calcin'd, this we call Reverberation. At the Mines they have another Species of Calcination, called Roaſting, wherein they either underlay, or ſtratify the Ore with Billet-wood, and then ſet fire to the Pile; or they diſpoſe of the Wood in peculiar Furnaces, ſo that the Flame may play thro' and all over the Ore, by being reflected back thereon.

3. It is obſervable, that many Things, as Lead, Regulus of Antimony, *&c.* become more ponderous by calcining; tho' it be certain they loſe much in that Operation, as appears not only from the plentiful Fumes that manifeſtly fly off, but from the Reduction, which becomes impracticable without the adding anew what the Metals loſt in Calcination; and notwithſtanding the full Weight of the deſtroy'd Metal is not refunded: and this induc'd *Kunckel* to obſerve, not only the Weight, but the Bulk or Volume alſo; and he found that ſuch calcin'd Bodies were increaſed in Weight, but diminiſhed in Bulk. *Vid. Ejus Obſerv. Chym.* P. II. c. 2. p. 32.

4. Along with the Fire, other Things, as Sulphur, Mercury, Arſenic, Zinck, and the ſeveral Salts, are called in Aid.

5. But

5. But particularly Nitre; and as it attacks with great Noise and Violence, and is lighted up into a Blaze with the inflammable Matter contained in Metals, Minerals, and other Things, the Operation is hence called Detonation.

6. Now this is sometimes performed in close Vessels, as in tubulated Retorts, furnish'd with proper large Receivers, to catch the Spirits and Flowers ascending in Detonation; but for the most part in an open Vessel, as a Crucible: In the former Way the *Spiritus carminativus de tribus*, the *Tinctura nephritica Amalungiana* and other *Clyssi* are made: the latter Method is commonly used for the Preparations of diaphoretic Antimony; tho' it be more adviseable to detonate in a tubulated Retort, whereby you obtain a good Proportion of Flowers, and a fine Clyssus of Antimony; both which are otherwise lost.

7. In the Detonation in close Vessels of a moderate Size we are to observe the following Particulars: 1. Not to lute the Junctures too close, but leave an Air-vent for the displosive Spirits, when they come in too large a Quantity, to escape and expire a little, and not burst the Receiver: On which account, 2. The Matter you would deflagrate must be

be put in by little and little: And, 3. Some Water or Spirit of Wine poured into the Receiver, wherein the Vapours may ſettle.

8. The Calcination with other Salts, or even with Sulphur and Arſenic, is alſo oftner performed in cloſe Veſſels; after that the Matters to be calcin'd, eſpecially Metals, are thinly laminated and granulated ſmall, and then mix'd or ſtratify'd with the Salts, pounded Sulphur or Arſenic, and ſuffer'd to calcine for ſome Hours together in an earthen Crucible, with its proper Cover; and this we call Cementation.

9. And in particular this Operation is uſed for exalting or heightening the Colour of Gold, and purifying it from the ignobler Metals; and then call'd the Royal Cement.

10. Yet this Method may be very properly employed in calcining Copper with Sulphur, and in making the Vitriol of Copper, or in blanching Copper with Arſenic; for if you would put the Mixture in an open Crucible on the Fire, the Sulphur or Arſenic would quickly evaporate e'er the Metals were ſufficiently penetrated.

11. The igniting of Salts apart in a moderate Fire, ſo as not to melt or run together, is alſo commonly called a Calcination; and

from

from the crackling Noiſe common Salt yields, Decrepitation. But Alum and Vitriol at firſt totally change to a Water, and boil a long time e'er the ſuperfluous Moiſture evaporates, and then the Alum heaves much, and becomes porous; but the Vitriol condenſes very cloſe, and muſt be pounded anew, if you would either diſtil or mix it with other Matters, and therefore it ſcarcely deſerves the Name of a Calcination; an Appellation more applicable, when Vitriol in the Heat of the Sun or of a Stove is made to fall into a porous poudry Matter.

12. Yet ſuch Appellations are not always ſo very accurately employ'd, ſeeing the hanging up in the Still-head, during Diſtillation, thin Slices of Hartſhorn, in order to their being penetrated, ſoftened, and made tender by the hot Steams, is alſo called a philoſophical Calcination; or the boiling them in common Water till they become white and brittle.

13. Vitrification generally follows Calcination; for what in a moderate degree of Heat turns to a porous Powder or Calx, in a more vehement one runs together into a tranſparent Maſs or glaſſy Body; yet always ſome Subjects more readily than others: *e. gr.* in the mineral Kingdom calcin'd Lead, Biſmuth

Bismuth and Antimony easily melt to a Glass; Calx of Tin and *Crocus Martis* on the contrary more difficultly. The Ashes of Vegetables, but especially if mixed up with Sand or Flint, readily vitrify; and in this manner the common Glass is prepared: the Ashes of Animals on the contrary, or their calcin'd Horns and Bones, not without Addition of other fluxile Matters; and then they yield a Milk-colour'd and opake Glass, almost like Porcelain. *Vid. Becher. Phys. subter.* Sect. III. c. 3. §. 2.

14. The most noted Instance of Vitrification in pharmaceutic Chemistry is the Glass of Antimony, which is best of all made of calcin'd Antimony, without any Addition; only regard must be had to the following Circumstances, if you would have it sufficiently transparent. 1. Calcine the Antimony well, and when it has cak'd together, again rub and grind it fine. 2. Suffer it to flow for a sufficient Space of Time, and when its Surface is transparent, try whether it be so within too; if not, let it run some time longer. 3. You are not to treat it much with Iron, or let the Coals fall into the Crucible, as thereby it might be reduc'd, and commence a Regulus.

15. Cupelling is alſo a Species of Vitrification, wherein Lead vitrifies in a ſtrong Heat, and retires into the porous Body of the Cupel or Teſt, at the ſame time vitrifying the other imperfect Metals added thereto, and carrying them along with it into the Cupel, while the Gold and Silver, which cannot thus be reduced to Glaſs, amaſs together and remain on the Cupel.

16. The Operation by the Cupel chiefly depends on the following Particulars. 1. The Cupel muſt conſiſt of a porous and ſpongy Subſtance; and for this Purpoſe elixated Wood-aſhes and ſome calcin'd Bone are commonly uſed. *Cardilucius* teaches how to make Cupels of Spar, and aſſures that they exceed thoſe of Aſhes, in that they require no long time to anneal or ignite under the Muffle. 2. You muſt give a ſufficient degree of Fire, for the Lead to fume; or, as it is called, *drive*, and thus vitrify; yet the Fire muſt not be too ſtrong, that the Lead may not carry off and deſtroy ſome of the good Metal. 3. You muſt give a proper Quantity of Lead, when you ſuſpect the Gold or Silver to hold much Impurity; generally 16 Parts of Lead to one of the Metal which is in the Gold or Silver.

17. Cupel-

17. Cupellation is alſo ſometimes performed on Aſſay-teſts, and properly called Scorification; or in the large Way, on refining Hearths or Furnaces; whereon the Lead ſcorifies, and is forced off to the Sides, the Gold and Silver remaining in the middle of the Hearth; yet in this Way too the Metals ſtill have ſome Alloy, and muſt therefore be cupelled or teſted to their full degree of Fineneſs.

18. For further Information in theſe Matters, the Reader may conſult *Modeſtinus Fachſeus*, *Lazarus Ercker*; and among the Moderns, *Schindler*, and *Paræus*'s *Probierbücher*; as alſo *Stahl*'s *Anweiſung Zur Metallurgie*, Elements of Metallurgy.

CHAP. VII.

Reduction and Revivification.

1. REduction denotes the bringing any thing back to its former State and Conſiſtence, and is properly underſtood of Metals calcined, vitrified, or otherwiſe de-

ſtroyed, when by proper Additions they attain to their former Fuſibility and Ductility.

2. Now this is done two ways; either by taking from, or adding ſomething to the Subject. By the firſt way, the rapacious Salts or Sulphurs cleaving to the deſtroy'd Metals, are by proper Means either taken away or obtunded, that the pure Metal may after that fuſe or run together; as for Inſtance, when *Aurum fulminans* is by Calcination along with Sulphur diveſted of its fulminating Quality, and then fuſed with Borax; or when, according to *Kunckel*, *Luna cornua* is calcin'd with Suet, or other fatty Matters, and fuſed along with common Salt.

3. By the ſecond Method we add ſome eſſential Part or other to the Subject; and this is peculiarly needful for the ignobler Metals, as Iron, Tin, Lead, Copper, as alſo for Biſmuth and Regulus of Antimony, as in Calcination and Vitrification they loſe a Part of their Subſtance; wherefore they can never attain to their former metalline Conſiſtence without the Reſtoration of what they loſt.

4. From this it is eaſy to conclude, that bare alkali Salts alone are not ſufficient in this Caſe, as ſome groundleſly imagine, but that we muſt along with theſe Salts call in Aid

ſomething

ſomething that ſhall reſtore to the Metals their ſulphureous Principle; and ſuch is crude Tartar, and the black Flux-powder prepared therefrom; alſo Soot, Coals, Pitch, Soap, Suet, and other Fats. On this Principle Iron-filings may be employ'd in promoting the Reduction of eaſily fuſible Matters, as the Glaſs of Antimony and Lead, alſo Lead calcin'd with Sulphur. *Vid. Stahl's Anweiſung zur Metallurgie in der dabey befindlichen Einleitung zur grand-mixtion*, p. 109. ſeq. §. 16.

5. The Reduction of a larger Quantity is to be performed in a Tap-furnace; and here you ſtratify the Coals and calcin'd Metal or Ore alternately, and at laſt the melted Metal is tapp'd or drawn off below: at a Pinch, and when you have but a few Pounds to reduce, you may do it in a Crucible; and here you are to take not the ſame Weight, but the ſame Meaſure of Charcoal-duſt, and half the Weight of Pot-aſh, or other alkali Salt, as you have Matter to reduce; mixing them well together you put all by Ladle-fulls into a Crucible that is capacious, as the Matter is otherwiſe apt to heave and ſhed over: and thus you may eaſily reduce diaphoretic Antimony, Glaſs of Antimony, *Crocus Metallo-*

rum, Lead, Litharge, Minium, Glaſs of Lead, and the Lead imbib'd in Cupellation. This is one of the moſt curious Operations in all Chemiſtry, and a Skill in it not ſo eaſily acquired as one may be apt to imagine. As the Deſtruction, ſo alſo the Reduction of Metals is manifold; hence any one that would propoſe the Exaltation of Metals, muſt firſt attain to the ready Knack of reducing them, as on it a great deal depends in peculiar Proceſſes of Alchemy.

6. Revivification is peculiarly applied to Mercury only, when we fix it either by means of Sulphur or the ſeveral corroſive acid Spirits, and take it out of its running Form, and deaden it as it were; afterwards ſeparating theſe Matters therefrom by proper Additions, and reſtoring it to its former running State, we quicken or make it living.

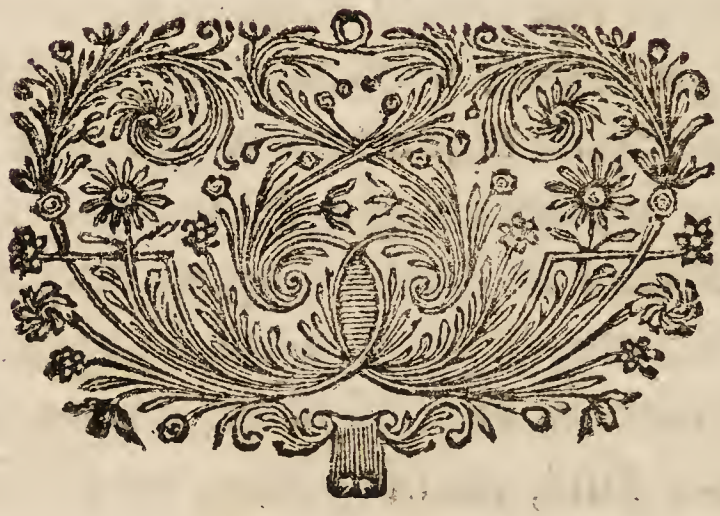
7. But as the Ways of fixing Mercury and diveſting it of its Fluidity may be different, ſo are the Means of recovering and reviving it different too; for Inſtance, Cinnabar and Æthiops mineral are beſt revived with Iron Filings, or pounded Regulus of Antimony; and the Regulus gives again a true Antimony, which is therefore called *Antimonium regeneratum*. Corroſive Mercury-ſublimate and

Mer-

Mercurius dulcis can again eaſily recover their fluid Form, upon mixing them up with an equal Weight of Regulus of Antimony, or Iron Filings, and afterwards diſtilling from a Glaſs Retort; the former gives over a ſubtile Butter of Antimony, the latter a red Sublimate, which in the Air relents into a yellow fatty Liquor. The mineral Turbeth, the *Arcanum Corallinum*, and other Precipitates made with Aqua fortis or Spirit of Nitre, much ſooner reſuſcitate than one would imagine, when one would edulcorate, as is commonly preſcribed, with the Spirit of Whites of Eggs, Spirit of Tartar, or Spirit of Wine. Mercury precipitate *per ſe*, or that without any Addition fix'd by a long continu'd Sand-heat, and changed into a red Powder, again revives without any Addition, and re-aſſumes its former fluid, running State, to a little grey porous Powder only, upon committing it in a Retort to a naked Fire.

8. But it is obſervable that the fix'd Alkali's, and the pure urinous Spirits, and *Salia volatilia non oleoſa*, are by far not ſo proper for reviving Mercury as the Matters juſt mention'd; for Cinnabar mixed up with equal Parts of volatile Salt of Hartſhorn, and ſet to digeſt, is ſcarce in any wiſe changed thereby.

Mercury-ſublimate rubb'd or ground with its Weight of volatile Salt of Hartſhorn, and expoſed to the Air, neither moiſtens nor revives, which yet befals it in a ſmall time, if but groſly ground and ſpread abroad on a Tin or Iron Plate.



Hints

Hints for Lutes, and for ſome peculiar Encheireſes.

I. *A Lute for lining Iron Furnaces internally, as alſo for coating the Retorts to be uſed in Diſtillations in a naked Fire.*

IN this Caſe one muſt be directed by the Quality of the Clay one is ſupplied withal; if too fat, you muſt mix up with it a Third or Fourth of white Sand; but if a leaner Kind, it requires no ſuch Addition, only ſuffering it to dry, in order to ſearce it, and ſeparate it from the larger Stones; after which it is moiſtened with Herring-Brine, Bullocks Blood, or ſalt Water only, ſuffering it to ſoak thoroughly for a Night at leaſt, and then working it up together; and with it you may line Iron Furnaces within-ſide, or coat Retorts to be expoſed to a naked Fire.

To obviate the too many Cracks or Rents in the Lute as it dries, after ſearcing it in the manner mention'd, and e'er you moiſten it, mix

mix along with it some Hay or Hair, such as is used in Bolsters and Cushions, and then work it up with salt Water; it is however difficult to prevent them entirely, but when the Lute is dry run it over with your wet Hand, and close up the Rents.

The *Caput mortuum* of Aqua fortis, or some pounded Glass, Iron Scales, *&c.* mixed up with it, may be of some Service, but not absolutely necessary.

When Furnaces lined with such Luting are fully dry, and the Chaps closed up, you may run them over with a Paste made of powder'd Litharge and Water, such as Potters use in glasing, and which bakes or neals very smooth.

II. *Lute for the Junctures of Retorts and their Recipients in distilling in a naked Fire, as also for coating Bodies and other Glasses, when they are to be used in a strong Sand-heat.*

Take Brick-earth, let it dry well, in order for searcing, then mix some Straw therewith, and sprinkle it with common Water; let it stand for a Night at least, then work it up into a Paste, and it is fit for Use. The Coating for Glass Vessels should be no thicker than the

the Back of a Knife, and when it chaps in drying, run it over with your moiſt Hand; when fully dry, do over both the Junctures and Coatings with a little Linſeed-Oil; not too much, but here and there, as otherwiſe the Luting would become too hard, and compreſs the Veſſels; the Oil penetrates into the Luting, and gives it an uncommon Firmneſs when afterwards expoſed to the Fire; as *Becher's Experimentum Ferriferum* ſhews; whereby he teaches how to make a genuine Iron from Brick-earth and Linſeed-Oil. *Vid. Becher Supplem.* I. *in Phyſ. Subterr. It. Miner. Aren.* L. A. p. 854.

III. *Luting for the Junctures and Cracks of Glaſſes.*

Take unſlack'd Lime, grind it fine, and work it up with freſh or new Cheeſe into a thin Salve, with which ſpread a linen Rag or piece of Paper, which lap round the Junctures, or lay on the Cracks. Obſerve to make no more of it than you have immediate occaſion for, as it turns hard in half an Hour's time. A Paſte made of freſh pounded Lime along with Whites of Eggs, and ſpread on a linen Rag and laid on the Rents, holds very firm.

IV. *Another*

IV. *Another Luting for the Rents and Cracks of Glaſs Veſſels.*

When a Glaſs Veſſel has but a ſmall Rent, after heating the Glaſs it often grows bigger, and ſpoils the whole Glaſs; to prevent which the preceding Lute is of Service; or rather the following when you treat any corroſive Spirit. Take Minium or Litharge, grind to a Powder, and make them up into a Salve with Linſeed-Oil, with which to do over the Rents; it holds very well, but is long a drying.

V. *An everlaſting Lute, which is impenetrable.*

Firſt, make the following Varniſh: Take Litharge and Minium, of each 12 Ounces; Maſtic, Gum Sandarach, white Vitriol, of each half an Ounce; grind them fine, and boil with a Meaſure and a half of pure Linſeed-Oil in a ſoft Fire into a proper Varniſh; take well waſh'd Clay and Minium equal Parts, Litharge half as much, pulverize and mix them: Of this mix'd Powder and the above Varniſh take an equal Weight, and boil to a Maſs, that may be thicken'd or thinn'd

thinn'd at Diſcretion, as you have occaſion to uſe it in a ſtronger or weaker Fire; you need only preſs it hard on the Junctures, and it prevents the Eſcape of the moſt penetrative Spirits, and is always fit for Uſe; when too dry, only powder and boil it up with freſh Varniſh.

VI. *Another Luting for the Junctures in diſtilling for urinous Spirits, or oleaginous ardent Spirits.*

Take Swine or even Bullock's Bladder, cut it into broad long Thongs or Slips, as is needful, which ſoak in luke-warm Water and clap wet round the Junctures, and tying them down with Thread, when dry they ſtick very faſt, and ſhut very cloſe: when the Diſtillation is over, applying a moiſt linnen Rag on the Piece of Bladder, it looſens, and comes off without tearing, ſo as to ſerve another time; yet at length the Bladder ſlips, becomes hard and brittle, and unfit for Uſe.

Further, we are to obſerve, that between the Junctures of the Heads and Cucurbits, as alſo of Retorts and Receivers, doubled Slips of Paper are to be laid or roll'd round, partly for the Glaſs to ſhut the tighter, and partly that the Receivers, when the Retorts happen

to

to be glowing hot, may not ſo readily burſt; in which Caſe alſo lengthening Veſſels may be put between the Retort and the Receiver.

VII. *The purifying of* Aqua fortis *by Precipitation.*

Aqua fortis, either as it is commonly ſold, or as it comes over in the firſt Diſtillation, is unfit accurately to ſeparate Gold and Silver, as it diſſolves not the Silver entire, but lets ſome of it precipitate in form of a white Slime, which may remain in the Gold, and falſify the Aſſay; the Aqua fortis therefore muſt be firſt purified, or as it is called, precipitated, and that in the following manner: Put a little fine Silver-thread, or other pure Silver, nay, even Copper, into Aqua fortis, and let it diſſolve in the Warmth as much as it can: Of this Solution pour into the Aqua fortis in queſtion, and it becomes entirely milky and muddy, and is ſuffer'd to ſtand for a Day and Night, or till it ſettles; when clear, pour more of the preceding Solution to it, and if ſtill milky and muddy, it is not yet fully purified; it is therefore ſet to ſtand again and ſettle, and again more of the Solution poured to it; and being no longer turbid, but continuing clear, it is good, and fit

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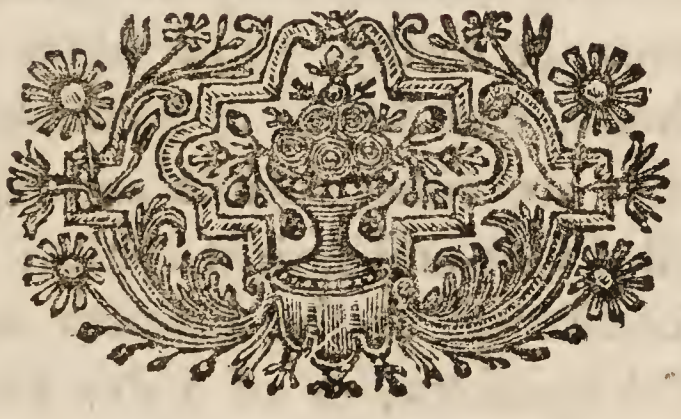
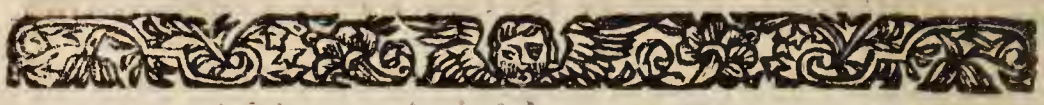
for the Depart; you may alſo without more ado filtrate it, which is the moſt expeditious way.

The white Slime, which in purifying Aqua fortis ſubſides to the Bottom, is only a Calx of Silver, which ſome hold for a *Luna cornua*, tho' neither ſo volatile nor ſo fuſible, but approaching neareſt to Silver-Calx, thrown down out of Aqua fortis with Spirit or Oil of Vitriol, and hence more eaſily reducible. *Vid. Stahl. Obſerv. Chym. Menſ. Febr.* p. 444.



SECT.



SECT. II.

The Chemical Productions.

CHAP. I.

Alkali's both fix'd and volatile.

1. THE chemical Productions may for the most part be reduced to the three following Classes; they are either saline, sulphureous, or earthy. The saline are Alkali's, Acids, and *Salsa*, or Neutrals. The sulphureous are either volatile and liquid, as the distilled Oils and ardent Spirits; or of a mean Consistence, as the Essences and Extracts of Vegetables; or of a dry Form, as Rosins, Flowers of Sulphur, Cinnabar. The earthy Productions are either totally fix'd, as diaphoretic Antimony, mineral Bezoar, *Antihecticum Poterii*, the various Crocus's of Iron; or semi-fix'd, as *Mercurius Vitæ*, Glass of Antimony, and most Magisteries prepared either by Solution or Precipitation.

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2. The ſaline Productions, as already mentioned, are beſt diſtinguiſhed into three Species; the firſt includes the Alkali's, both the fix'd and volatile; to the ſecond belong the Acids; the third Species conſtitutes the *Salſa*, or Neutrals, which are either of a liquid or dry Conſiſtence, volatile or fix'd.

3. The Alkali's take their Name from a certain Plant growing on the Sea-coaſt, or in Parts abounding in Salt, and by the *Arabs* called *Kali*. This, with other Plants growing on the Sea-ſhore, is burnt to Aſhes, and a Salt drawn therefrom, thence called the Salt of the Herb *Kali*, or with the Addition of the *Arabic* Article Alkali; and hence occaſion has been taken of denominating the ſeveral lixivious Salts procurable from the Aſhes of Vegetables, Alkali's. Now as all ſuch Salts effervefce with Acids, and diveſt them of their Acidity, the Appellation has afterwards been extended further, and applied to urinous Spirits and Salts; nay, Lime, Chalk, burnt Hartſhorn, and almoſt all earthy Subjects have been reduc'd to this Head; but as theſe laſt diſſolve not in Water, and paſs along therewith thro' the Filtre, which yet is a principal Requiſite of a Salt, it is better to

make a particular Claſs of them, and call them Antacids, not Alkali's.

4. In conſideration of which we have only two Species of Alkali's, *viz.* fix'd and volatile; the former are the lixivious Salts, prepared by Incineration or Calcination; the latter are the urinous volatile Spirits and Salts. Among fix'd Alkali's, the beſt known and moſt in uſe, are, Salt of Tartar, fix'd Nitre, extemporaneous Salt of Tartar, Pot-aſh, *Spaniſh Soda*; and in fine, the Salts procured from diuretic and ſudorific Herbs, as Salt of Wormwood, Carduus-benedictus, Broom, Reſt-harrow, Bean-ſtalks, *&c.*

5. Salt of Tartar greatly exceeds in Purity, Fuſibility, and Pleaſantneſs, common Pot-aſh, or that alkali Salt elixated from common Wood-aſhes in Iron Pans, and afterwards calcin'd in peculiar calcining Furnaces. It might formerly have been prepared from the Aſhes of the Vine-cuttings, which alſo give a very ſharp and white Salt, hence ſtill call'd *Cineres clavellati*, and then one needed not ſcruple to ſet it on a Footing equal with, or to ſubſtitute it for Salt of Tartar; but as the *Cineres clavellati* are at this Day prepar'd and ſold under the known Name of Pot-aſh, they cannot be promiſcuouſly uſed for Salt of Tar-

tar

tar in any particular medicinal or chemical Intention, which requires a pure Alkali; or at leaſt the Pot-aſh muſt be ſeparated from its neutral Salt, either by Solution in cold Water, or by a ſpontaneous Deliqueſcence; as *Kunckel* rightly hints in his *Obſ. Chym.* P. II. c. 10. p. 136. *ſeq.* Nay, for particular Proceſſes, as the reducing Salt of Tartar to a volatile Salt or urinous Spirit, ſuch is the fitteſt which has been drawn from the *Caput mortuum* of Spirit of Tartar, without any preceding Calcination, as being what is elixated from Tartar calcin'd to Whiteneſs; as *Ludovici de volatiliſatione ſalis tartari* teſtifies from his own Experience.

6. The extemporaneous Salt of Tartar is prepared from equal Parts of Salt-petre and crude Tartar, pounded ſmall together, and detonated in a glowing Crucible; but if to one Part of Nitre you take two of crude Tartar, grind them together, light them up and ſuffer them to burn out, you have no pure white Salt, but much of the coaly Subſtance of the Tartar remains therein, and hence commonly called the Black-flux, and moſt uſed for the Reduction of calcin'd Metals. The *Sal fixum* differs not much from the extemporaneous Salt of Tartar, only that

here, inſtead of Tartar, we take Charcoal-duſt, *viz.* the Nitre is ſuffered to run in a Crucible, and on it in Flux are gradually laid Coals groſly beaten, till they no longer deflagrate with the Nitre; after which it is ſtill ſuffered to melt for a while, and then pour'd out into a heated Iron Mortar, where in cooling it turns of a greeniſh Caſt; and of this a certain Chemiſt, *Chriſtian Adolphus Balduin*, would make ſomething extraordinary, and teaches how to extract a red Tincture with highly rectified Spirit of Wine, ennobled with the magnificent Title of a golden Tincture. *Vid. ejus Aurum Auræ, Lipſ. Anno* 1675. 12*mo.* but when expoſed to the Air, it runs, like other Alkali's, into a fatty Liquor, called by ſome *Glauber's Alkaheſt*, but commonly *Liquor nitri fixi*, and affords an excellent Solvent for opening Amber, Myrrh, and ſulphureous Subjects, when imbibed therewith, before Extraction with Spirit of Wine.

7. *Spaniſh Soda* differs from Salt of Tartar, fix'd Nitre, and the common lixivious Salts, in that it is ſomewhat ſaline, as being procured from Plants growing on the Sea-ſhore, and therefore comes neareſt to the Alkali of the Ancients; beſides it affords a much finer

and

and more lasting Glass than the Salts prepared from common Ashes, the Glass of which is perishable, and easily corroded by acid Menstruums, nay, even by the bare Action of the Air. *Vid. Stahl's Metallurgie in der dabey befindlichen einleitung zur grand-mixtion.* p. 318. §. 34.

8. The other fixed Salts from Plants are mostly employ'd in Medicine, as Diuretics and Sudorifics; and in this Intention *Mynsicht's Lixivium benedictum* is famous; yet some commend Salt of Fern for Glass-making, and the fixed Salt from Oak, or the Ashes only of the Bark or Spray of that Wood, for eating away the Skin without any extraordinary Pain.

9. As to the Effects of these Salts in the human Body, it is a great Dispute whether they retain the specific Virtues of their Simples. To decide herein, we must carefully weigh partly the Virtue of the Plants themselves, and partly the Manner of Preparation; for when the Virtue of a Plant principally consists in a volatile, strong-smelling or sharp-tasting Substance, this Substance is undoubtedly driven away by the Incineration or Burning; so that the fix'd Salts of cathartic Plants shall no longer purge, those of venomous

Plants hold no Poiſon, and narcotic Simples be no longer poſſeſſed of a narcotic Quality: But as to the opening, attenuating, ſudorific and diuretic Virtues of Herbs, theſe are ſo far from being deſtroy'd, that by Incineration ſuch Virtues are imparted to ſeveral Plants.

10. Further, if you gently calcine the Plants, and ſuffer them ſoftly to glow on each other, the Salts procured therefrom acquire more of the Virtues of their Simples, than when they are calcined with a ſtrong Fire, or with Sulphur; or when the elixated Salts, after the firſt Coagulation, are ſtill repeatedly calcined, diſſolved, and again coagulated: tho' in the firſt way they are ſomewhat dark-colour'd, and not ſo white, nay, are apter to run *per deliquium* than in the latter way, yet in medicinal Virtue they far exceed them: as *Borrichius* remarks in his *de Hermet.* and *vet. Ægypt. Sapient.* L. II. c. 5. §. 8. p. 353 and 370. and hence, p. 358, he adviſes to calcine the Plants in cloſe Veſſels, and directly elixate them.

11. As to the Effect of fix'd alkali Salts in diſſolving Sulphur, Antimony, Flints, and other Stones, as alſo in precipitating the ſeveral Solutions made by means of acid Menſtruums, we have already made mention above;

bove; we ſhall here only hint at the twofold Change which fixed Salts undergo when cemented with Quick-lime, or when repeatedly run *per deliquium*, and again coagulated; as in the firſt way they acquire a greater degree of Acrimony, and in the latter an uncommon degree of Fuſibility and Penetrancy.

12. *Van Helmont*'s greatly crying up the fix'd Salts of Plants, when volatiliz'd, for medicinal Uſes, and his ſetting the volatiliſed Salt of Tartar almoſt on a Footing equal with his *Alkaheſt*, has given occaſion to the Attempts made towards the volatiliſing fix'd Alkali's. Indeed *Van Helmont* himſelf in his Treatiſe *de Tribus Chymicorum principiis*, §. 84. gave ſome Light to the Matter, in regard he aſſures, that if an Alkali, as Salt of Cinnamon, be impregnated with its own diſtilled Oil, and digeſted for three Months, they together commence a volatile Salt, which ſhall have all the Effects that could be expected from the Simple. And in the ſame View is *Starkey*'s *Corrector Vegetabilium*, wherein he impregnates Salt of Tartar with Oil of Turpentine, digeſts and rubs them together till they acquire a ſoapy Conſiſtence, ſo as to diſſolve in warm Water without the Separation of any Oilineſs. *Ludovici* alſo *de Volatiliſatione ſalis*

tartari, p. 48. aſſures, that he had imbib'd Salt of Tartar with its own empyreumatic Oil, put them together into a Retort, and ſet them only to ſtand for a Winter on a warm Furnace, when the Salt of Tartar was afterwards almoſt totally ſublimed a volatile Salt; ſo that the Method of volatiliſing fix'd Salts with their own Oils, or other diſtilled Oils, is not without its Foundation; the only great Difficulty is, that fix'd Alkali's are ſo very backward to incorporate with diſtilled Oils: hence *Caſſius* adviſes to ſaturate them firſt with Vinegar, whereby they more readily receive into themſelves the diſtill'd Oils: but *Stahl* propoſes the rubbing fine the alkali Salts whilſt ſtill warm, and only moiſtening them a little with ſuch diſtilled Oils, and then letting them run *per deliquium*; and ſhould any of the Oil poured thereto re-ſeparate, it might be decanted off, the Salt gently cryſtalliſed be again impregnated and ſet to run; and thus in a few Weeks time one might procure what would otherwiſe take up many Months to accompliſh. *Vid. Stahl's Anweiſung zur Metallurgie in der dabey befindlichen einlitung zur grand-mixtion*, p. 323. §. 75.

13. Others,

13. Others, as the Author of the *Experimenta Lulliana*, and *Chriſtopher Reinhard* in his *das licht der natur*, propoſe the Volatiliſation of Salt of Tartar by means of a highly rectified Spirit of Wine; but tho' both the Spirit of Wine and the Salt of Tartar be conſiderably changed, the latter is ſtill far from aſcending in Diſtillation; as not only *Ludovici* in the above Treatiſe, but any one's own Experience may ſhew. Somewhat more probable is what others propoſe, *viz.* the ſaturating the fix'd Salts firſt with diſtill'd Vinegar, and then incorporating them with an urinous Spirit, and ſo volatiliſing them; tho' this Attempt may not be without its Difficulties too.

14. We incline not to dwell any longer on this Subject, but rather proceed to the Alkali's, which are naturally volatile: Of theſe the Spirit and volatile Salt of Urine are beſt known, and from them the other receive their Denomination, urinous; nay, they are often ſimply called volatile Salts, an Appellation held ſynonimous with volatile Alkali's: but there are alſo acid volatile Salts, as the volatile Salt of Amber, the Oil of Vitriol, and Spirit of Salt, when being diſtilled without putting Water into the Receiver, or in an exceſſive

ceſſive Cold, they appear in the Form of a dry Salt; and therefore it is better to ſpecificate them, by calling them volatile urinous Salts.

15. They are denominated Alkali's, as they, like the lixivious Salts or fix'd Alkali's, effervesce with Acids, obtund their Acrimony, precipitate what they diſſolve, and along with them conſtitute a neutral Salt of a mean nature; but they are denominated volatile, partly as in Rectification they aſcend before the Phlegm, and of themſelves evaporate in the Air; partly as in combining with Acids, they yield not a Salt that endures the Fire, but only a mean Salt, which indeed riſes not before the Phlegm, nor diſſipates in the open Air, yet fumes away e'er its Ignition, or ſublimes in cloſe Veſſels.

16. The beſt known and moſt uſed among theſe, are Spirit and volatile Salt of Urine, volatile Salt of Hartſhorn, Vipers, Soot, the Spirit of Sal-ammoniac, both the ſimple and that prepared with Quick-lime.

17. An urinous Spirit and volatile Salt may indeed be drawn not only from Land Animals, but, as *Borrichius* from his own Experience teſtifies, from Fiſhes; as alſo from the ſeveral Parts of Animals, not only their

Urine

Urine and Horns, but alſo their Claws, Hair, Blood, Fleſh, and even from Silk itſelf; but as they are either too nauſeous, or their Virtues not ſufficiently underſtood, we generally abide by the above-mention'd.

18. Spirit of Soot is from the Vegetable Kingdom, and therefore a clear Proof that Vegetables alſo are not to be excluded; but in order to yield a genuine urinous Spirit, they muſt be previouſly brought to Putrefaction, otherwiſe you have an acid or bitteriſh Spirit, like the Spirit of Tartar; but when they are ſufficiently opened by Putrefaction, they all give forth an urinous Spirit, as *Wedelius* has explicitly ſhewn in his *duo Schediaſmata de ſale volatili plantarum*; and as appears from the dry'd Lees of Wine upon diſtilling by the Retort.

19. Some however are wont ſollicitouſly to diſtinguiſh between a Spirit and an urinous volatile Salt; but in this Diſtinction there is nothing farther, than that the Spirit is a volatile liquid Salt, and the volatile Salt a coagulated Spirit; and therefore the volatile Salt, when diſſolv'd in its own Phlegm, may commence a Spirit; and the Spirit, when ſublimed with a ſoft Heat in a Matraſs, may become a volatile Salt; yet this laſt Change

ſucceeds

ſucceeds better with the Salts of the Animal Kingdom, than with thoſe prepar'd from Vegetables. The ſame thing alſo holds as to Spirit of Urine *per ſe*, and much more does Spirit of Sal-ammoniac diſtilled with Potaſh, give forth a dry volatile Salt, than when made with Lime. As to theſe three Sorts, *viz.* Spirit of Urine *per ſe*, Spirit of Urine prepar'd from Sal-ammoniac with Pot-aſh or Salt of Tartar, and the Spirit from Sal-ammoniac and Quick-lime, we are to obſerve the following things. 1. Spirit of Urine *per ſe*, if not abſtracted from its Remainder after all the Phlegm is drawn off, changes not readily into a coagulated Spirit; but if either the whole be drawn off to Dryneſs, or the firſt true urinous Spirit running from the *Caput mortuum*, the Spirit ſeparates from the Phlegm, and changes to a dry volatile Salt; the reaſon is, that as after the Phlegm, nay, e'er the empyreumatic Oil aſcends, there appears a ſharp acid Spirit, highly ſubtile and penetrative, which coming in Contact with the urinous Spirit, coagulates it, there thence reſulting a volatile Salt, or a Species of a highly ſubtile Sal-ammoniac: without this Acid, when the Proceſs is pure, and only the firſt Spirit taken which riſes from the putrefied Urine

before

before the Phlegm, the Spirit ſcarce, or not at all coagulates; an Obſervation but little regarded, and as little is the reaſon of the following Operation weigh'd. 2. When the Spirit of Urine is diſengag'd from Sal-ammoniac by means of Potaſh or Salt of Tartar, there then plentifully aſcends a volatile Salt; on the contrary, when diſentangled by means of Quick-lime, there only riſes a liquid Spirit, which is difficultly reduced to a dry volatile Salt; the reaſon is to be ſought for in the difference of the Additions, Pot-aſh being a Salt conſiſting of an Acid and an Earth, but quick-lime of a bare Earth only; when therefore Sal-ammoniac is added to Pot-aſh or Salt of Tartar, the Acid of common Salt in the Sal Ammoniac ruſhes on the Earth of Salt of Tartar or Pot-aſh, and ſtrikes out the vegetable Acid, as what is more ſubtile, from its Earth. Now as alſo in Sal-ammoniac, after the Acid of Salt has ſeized on the vegetable Earth, the Spirit of Urine is ſet free and ſtruck out, the ſubtile vegetable Acid and the Spirit of Urine aſcend both together, abſorb each other, and appear a dry volatile Salt; on the contrary, when Sal-ammoniac comes in contact to Quick-lime, the Acid of Salt ſeizes on the Earth of the Lime, and lets go the Spirit of

of Urine; and as the Lime holds little or no Acid, the Spirit of Urine aſcends alone in a liquid Form, at leaſt it abſorbs not ſo much Acid as is neceſſary to its Coagulation; hence ſuch a Spirit is difficultly reduced to a dry Salt.

20. This other difference between urinous Spirits, which are the Reſult of Putrefaction, or which are diſengaged by means of Lime, Pot-aſh, and other lixivious Salts, and thoſe which are firſt forced off by a ſtrong Fire, deſerves our Regard; the former riſe in Diſtillation before the Phlegm, but the latter come off firſt, after all the Phlegm is over, and the Still begins to glow; thoſe are much purer, more agreeable and volatile; theſe on the contrary combin'd with much empyreumatic Oil, and therefore conſiderably fætid.

21. Yet they lay aſide their fætid Odour in a good meaſure, and become alſo conſiderably purer and clearer, if firſt their empyreumatic Oil be parted from them as much as poſſible by the Separating-glaſs, and afterwards they be rectified a number of times *in Balneo* on Pot-aſh, or their own *Caput mortuum*, which has firſt been calcin'd to Whiteneſs. In this manner may Spirit of Hartshorn and Soot, both which are very nauſeous, be

be made as clear and pure as a Spirit of Sal Ammoniac.

22. We are alſo to obſerve, that the urinous Spirits, well rectified and dephlegmated with a highly rectified Spirit of Wine, coagulate together; in particular, Spirit of Hartshorn and Spirit of Sal Ammoniac made with Pot-aſh does this very readily, but not ſo with the urinous Spirit from Wine-lees, or with Spirit of Sal-ammoniac prepar'd with Quicklime: But when ſuch a Coagulum from an urinous Spirit and Spirit of Wine is expoſed to the Warmth, or drawn off *in Balneo* by the Alembic, it becomes fluid; and ſuch an urinous Spirit incorporated with Spirit of Wine diſſolves diſtilled Oils, which before it would not do: and on this Principle the *Salſa volatila oleoſa* are prepared; and in this View therefore you may without more ado, either in the firſt diſtilling of the Spirit of Sal Ammoniac with Pot-aſh, add to it the Spirit of Wine, or you may take the Spirit of Sal Ammoniac or of Urine, which has been made with Lime; for ſuch coagulates not with Spirit of Wine, and yet when previouſly incorporated with Spirit of Wine, it diſſolves diſtill'd Oils as readily, nay, more ſo.

CHAP.

CHAP. II.

Acids.

1. ACIDS are generally derived from the Mineral and Vegetable Kingdoms; for tho' *Vieussens* has in a peculiar Dissertation attempted to maintain that the fix'd Salt of the Blood yields an acid Spirit, and that the like was procurable from the fix'd Salt of Urine, it is rather Matter of Curiosity than a thing really useful and practicable. From the Animal Kingdom we draw an acid Spirit in the following manner: We softly distil a Quantity of Urine till all the urinous Spirit and Phlegm come over; at last, when all is near dry, and this must be well heeded, there ascends e'er the thick Oil comes over, a penetrative acid Spirit, yet in no great Proportion; this volatile animal Acid holds some oleaginous Parts, and hence it comes to burn like a Spirit of Wine, yet with a Flame somewhat more subtile, especially that Spirit prepared from the fæcal Matter. *M. Pott* in his *Dissertatio de Sulphuribus Metallorum*

Metallorum makes an Arcanum of it, and aſcribes peculiar Effects thereto, tho' he does not expreſly name ſuch Menſtruum. From fix'd Salt of Urine an acid Spirit is thus drawn in a large Quantity, *viz.* put one Part of Oil of Vitriol to two of Salt of Urine, or an equal Weight of calcin'd Vitriol, and diſtil; there aſcends a penetrative, fiery, acid Spirit, like a Spirit of common Salt, and the Oil of Vitriol lays hold on the Earth of the Salt, and makes of it a *Sal mirabile.*

2. The Acids from the Mineral Kingdom may properly be divided into three Claſſes. The firſt contains the ſulphureous vitriolic Acid, *i. e.* Spirit and Oil of Vitriol, Spirit of Alum, Spirit and Oil of Sulphur *per campanam*, and the *Spiritus aperitivus Penoti.* The ſecond includes the nitrous Acid, as the Spirit of Nitre, *Hoffman*'s ſmoaking Spirit, Aqua fortis, Aqua regia, bezoardic Spirit of Nitre, Clyſſus of Antimony. In the third Claſs we reckon the Acid of common Salt, *viz.* the common Spirit of Salt, the philoſophical Spirit of Vitriol; and even the Butter of Antimony.

3. Vitriol and Sulphur are indeed as to external Appearance conſiderably different, but in their Original they have the neareſt Affi-

nity poſſible; for if you ſublime in cloſe Veſſels a ſulphureous or vitriolic Pyrites, directly as it comes out of the Earth, it gives forth a good deal of an inflammable Sulphur, and no Vitriol; but expoſed for ſome time to the Air, it ſpontaneouſly relents, and afterwards elixated with Water, yields much Vitriol, with ſcarce any Trace of an inflammable Sulphur; and thus the Acid of Sulphur and of Vitriol differ not eſſentially, only that this laſt may alſo be ſet free in cloſe Veſſels by means of a ſtrong Heat, which ſucceeds not with the Acid of Sulphur; for Sulphur by a ſtrong Heat aſcends in cloſe Veſſels unſever'd, in its entire Subſtance, and conſequently its Acid muſt be diſengag'd by Deflagration in the open Air, wherein the aſcending acid Fumes are intercepted by means of a glaſs Bell, whence the Denomination of Spirit and Oil of Sulphur *per campanam.* It is certain the Acid acquires in the Deflagration from the inflammable Subſtance, with which it is entangled, a conſiderable Alteration and a degree of Volatility, as is eaſily perceivable from the penetrating Smell; yet in the Spirit or Oil of Sulphur *per campanam* little of it is obſervable; for what has conceiv'd any Alteration from the inflammable Subſtance, is ſo volatile

volatile as even to aſcend before the Phlegm, wherefore it evaporates and is quite loſt.

4. The beſt Method for obtaining or catching ſuch a volatile Spirit of Sulphur, is by means of a fix'd Alkali; and if the Sulphur burns ſoftly and leiſurely, it alſo yields more volatile Spirit; you may therefore fill a flat earthen Diſh or Bowl with pounded Sulphur, ſet a Match in the middle, and light it up; let it burn ſoftly and fume, hanging over the burning Sulphur linen Cloths moiſten'd with a ſtrong Lye of Pot-aſh: now after the Cloths are well impregnated with the Sulphur-fumes, the Salt is again elixated out of them and gently boiled; and you procure a peculiar neutral Salt, compoſed of fix'd Alkali and the volatiliz'd Acid of Sulphur. Upon pouring on this Salt an equal Quantity, or two Thirds of Oil of Vitriol, and diſtilling by the Retort, the fix'd Alkali ruſhes on the Acid of Vitriol, and lets go the volatile Acid of Sulphur, which comes over in form of a very penetrative Spirit, yet in no great degree acid. *Vid. Stahl's Anweiſung zur Metallurgie in der dabey befindlichen einleitung zur grand mixtion*, p. 350. §. 41.

5. A like ſulphureous Spirit may be drawn from Vitriol, upon diſtilling it in an earthen Retort that has ſome fine Rents at bottom, or in Iron Veſſels; but this is no peculiar Spirit, only a changing of the fix'd acid Spirit which is in Vitriol, by means of the phlegiſtic Particles, or thoſe conſtituting Flame; as the more fixed Acid, already ſeparated, namely, the Oil of Vitriol, acquires a highly penetrative ſulphureous Smell when cohobated with Spirit of Wine, or drawn off from running Mercury.

6. But the following Method is the beſt for diſengaging the Acid of Vitriol; the Vitriol is ſuffer'd to crumble into a ſpongy Powder in a warm Stove, or in the Sun; but if you firſt diſſolve and purify it in Water, or precipitate with Iron Filings or granulated Zink, the metallic aſtringent Earth, it is ſo much the better. Now the Vitriol thus reduced to a Powder, fill therewith two Thirds of a coated earthen Retort, and commit it to a Furnace, where it may have a Fire of Suppreſſion; at firſt a gentle Fire is adminiſtred, till the firſt and moſt ſubtile Spirits, which greatly heat and eaſily burſt the Receiver, together with the Phlegm, come over; after which the Fire is heighten'd, till the Receiver

ver is fill'd with white Fumes; and the ſame degree of Heat is to be kept up for two, three, or four Days, till no more white Fumes or Clouds appear; and at laſt the Fire is raiſed to the greateſt Pitch, or to a pure Flame: the Spirit brought over is poured all of it into a Cucurbit, which is ſet *in Balneo*; and firſt the ſubtile Spirit, which comes over in ſmall Drops, is drawn off, and then the Phlegm too; and this is continued ſo long as any thing will come over *in Balneo*; and there remains behind in the Cucurbit a dark colour'd, acid, ponderous, and thick Liquor, which on account of its Conſiſtence is commonly call'd Oil of Vitriol; but if the Rectification be performed from a Retort in Sand, after the Phlegm much white Fumes and acid Drops come over, generally called Spirit of Vitriol; but by the firſt Method *in Balneo* the whole of the Spirit by a careful Dephlegmation becomes an Oil, which alſo at laſt may be forced over with a ſtrong Fire; and by Rectification it becomes totally clear and bright, but is again eaſily tinged by the leaſt Bit of Wood, Straw, Roſin, and the like.

7. Alum greatly reſembles Vitriol, the difference conſiſting only in this, that Vitriol has for its Baſis a metallic, and generally a

martial or cupreous Earth, but Alum a calcarious or chalky ſort; yet the ſeparated Acid of Alum, or its Spirit, is not ſo much uſed as Alum in Subſtance, particularly when by due Calcination it is firſt ſet free from its ſuperfluous Phlegm, and then it may be commodiouſly employ'd in diſengaging the Acid of Nitre and common Salt from their alkaline Earths.

8. The *Spiritus aperitivus Penoti* is no other than a Spirit of Vitriol, ſomewhat alter'd by the Addition of calcin'd Tartar and Flints, ſo as not to be very ſharp and acid; nay, if in Diſtillation the Fire be too weak, there only comes over an inſipid Phlegm; which yet properly belongs to this firſt Claſs.

9. We now proceed to the ſecond Claſs, which contains the nitrous Acid, much more volatile than the vitriolic; but as in the Mixtion of Salt-petre it is entangled with an alkali Salt, it ſuffers not itſelf to be ſeparated therefrom by Fire alone; and therefore we commonly uſe Bole, Sealed-Earth, or that common Clay only which burns red in the Fire, and then mixing and working up the Salt-petre therewith, we diſtil the Mixture from a coated earthen Retort with a ſtrong Fire;

Fire; and in this manner is common Spirit of Nitre prepared.

10. The uſual Reaſon aſſign'd why Nitre requires ſuch Additions to make it give forth its Spirit, is, that in a ſtrong Heat it is apt to run together, and ſo not let go its Spirit; and conſequently its Parts muſt be diſcontinu'd or ſever'd from each other by ſomething that may prevent its Fuſion, that the Fire may have the greater Effect on it, and force out its Spirit; yet this agrees not with Experience, for at that rate Glaſs beaten ſmall or Sand might have the ſame Effect; nay, the Earth, which was once uſed, if firſt elixated, might ſerve ſtill quite as well as at the beginning; neither of which we find anſwer: and therefore there muſt be another Reaſon for it; to eſtabliſh which will be no difficult Matter, when we conſider that the nitrous Acid may be diſentangled from its alkaline Earth ſtill more eaſily by means of Vitriol or calcin'd Alum, and readieſt of all by means of Oil of Vitriol.

11. The vitriolic Acid is much more ponderous, or as we commonly ſpeak, much more ſtrong than the nitrous Acid and the Acid of common Salt; and therefore when it lays hold on the alkaline Portion of theſe Salts, both the nitrous Acid and that of

common Salt, as being more light and volatile, muſt cede, and thus be ſet free from their alkaline Earth. Now the more pure and free the Acid of Vitriol itſelf is, the better alſo it may promote the diſengaging the nitrous Acid and that of common Salt. Oil of Vitriol therefore is in this reſpect preferable to all other, as it is diſengaged from its metallic Earth and all ſuperfluous Phlegm; next to it is burnt Alum, and then Vitriol calcin'd to Whiteneſs; the weakeſt are Bole and Clay, which indeed is a vitriolic Earth, as appears from the red Colour it acquires in burning, yet the vitriolic Acid is very ſparingly therein; and therefore the Proportion of three Parts to one of Salt-petre is too little, there remaining after Diſtillation a good deal of Nitre unalter'd, which may be again elixated, and ſet to diſtil with freſh Bole, and it yields a Spirit as before, and this even to a third time.

12. Aqua fortis is no other than a Spirit of Nitre, which is uſually diſtilled in earthen Retorts or Iron Bodies with Vitriol calcined to Whiteneſs; and ſuch are under a Miſtake as imagine this Diſtinction to be between Spirit of Nitre diſtilled with Bole and Aqua fortis, *viz.* that the former is not only harmleſs, but alſo a wholſome Medicine, and the

the latter a noxious, corrosive, and deadly Poison; as there is no other Distinction than that drawn from the above Manner of Preparation; and that Spirit of Nitre with Bole or Clay is less subtile and volatile than that distilled with Vitriol, as that prepared with Alum still exceeds this; and that with Oil of Vitriol, all of them, in Penetrancy and Strength; and this is the Foundation of *Hoffman*'s smoaking Spirit.

13. Aqua Regia is nothing else but Aqua fortis, or Spirit of Nitre, strengthened or heightened with some of the Acid of common Salt, so as now to dissolve Gold, which before it could not do; and therefore it is all one whether you pour Spirit of Salt distilled apart on the Aqua fortis, or whether you dissolve therein common Salt itself, or Sal Ammoniac, and afterwards draw them off together, or whether without distilling you only dissolve the Salt therein; for if you only propose a slight Solution of Gold, there is no such great Odds between these several Preparations. Of like nature is the bezoardic Spirit of Nitre, which is Spirit of Nitre drawn off in the Preparation of mineral Bezoar from the Butter of Antimony; for from the Butter of Antimony, the Acid of common Salt which

was

was in the Butter, comes over; and thus of a Spirit of Nitre is made an Aqua Regia.

14. Yet Spirit of Nitre alone, when abstracted a number of times from fresh Nitre, may, as *Cramerus* hints in his *Collegium Physicum*, dissolve Gold; nay, Spirit of Nitre distilled with burnt Alum has the same Effect, if only so much Nitre be dissolved therein as it can dissolve cold. Spirit of Nitre also dissolves Gold, if in distilling, particularly with Oil of Vitriol, a highly rectified Spirit of Wine be put into the Receiver. In this Solution, upon distilling off the Spirit, we find that the Gold, e'er it is dry, falls down a massive Body; and this is to be ascribed to the inflammable Part with which the Spirit of Nitre is charged by the Spirit of Wine, as being the sole Cause of the Reduction; as Gold also precipitates in a massive Form out of Aqua Regia, or is rather reduced upon pouring in an Oil of Turpentine.

15. *Basil Valentine* teaches how to distil a peculiar Aqua Regia from Nitre with Sal Ammoniac, and which he calls the *Fechterbad*, *Aqua Pugilum*; but as Nitre deflagrates almost as violently with Sal-Ammoniac as with Sulphur, there is Danger in the Preparation, or it must be gone about with great

Heed-

Heedfulneſs in a tubulated Retort; which is alſo the beſt Manner of making the Clyſſus of Antimony or Sulphur with Nitre.

16. *Kunckel* in his *Obſervationes Chymicæ* gives another Method of diſtilling a very volatile Spirit of Nitre with Arſenic; and it has in particular this Advantage, that upon putting it into a dry Glaſs, and cloſing it up tight, it will for upwards of a Year together retain the deepeſt red Colour, and neither coagulate nor alter its Colour; yet a certain Author complains that this Mixture of Arſenic and Nitre does in Diſtillation take fire and burſt every thing to pieces.

17. But we proceed to conſider the Acid of common Salt; and this is the weakeſt of all, and muſt on this Score yield to the nitrous Acid, as this laſt does to the vitriolic; for upon pouring a Spirit of Nitre on common Salt, and diſtilling it therefrom, a Spirit of Salt rather than a Spirit of Nitre comes over, a genuine inflammable Nitre remaining behind; then pouring Oil of Vitriol thereon, the Spirit of Nitre comes over firſt; but otherwiſe the Acid of common Salt is commonly diſentangled with Bole, Sealed-Earth, or common Clay; but better with burnt Alum, and beſt of all with Oil of Vitriol:

triol: the reaſon has been aſſigned above, when we treated of the nitrous Acid; for in this reſpect there is an Affinity between the nitrous Acid and that of common Salt.

18. Yet we may alſo, without any Addition, diſtil from common Salt a ſubtile Spirit, as *Lemery* relates of *M. Seignette*, an Apothecary at *Rochelle*, nay, as I have learned from my own Experience, and generally at the ſame time you procure ſome Sublimate, entirely reſembling a Sal-ammoniac; but for this Purpoſe the beſt Salt is that boiled laſt of all from the Brine, which neither ſhoots, nor ſcarce becomes dry; and it is worth obſerving, that upon expoſing again the *Reſiduum* only to the Air, it becomes damp, and gives forth more Spirit; and this may be repeated as often as you will. In like manner may a Spirit be diſtilled from Nitre without Addition, by diſſolving the Nitre in Water, and ſuffering a Part of the Nitre to ſhoot, till there remain an oleaginous Liquor, which when diſtilled yields alſo a Spirit, like Brine of Salt.

19. The philoſophical Spirit of Vitriol is reducible alſo to this Claſs, tho' its Name would ſeem to give it a Place in the firſt; for it is no other than the Water, where-

with

with the Butter of Antimony is thrown down and edulcorated, in making *Mercurius Vitæ:* but that the Acid which is in the Butter of Antimony, properly proceeds from the common Salt, appears hence; becauſe Spirit of Nitre, as was ſaid above, commences thereby an Aqua Regia: as otherwiſe ſome give this philoſophical Spirit of Vitriol pretty ſtrong even internally, for allaying febrile Heat; yet it were better for that Purpoſe to rectify it once more, than only ſeparate it by Filtration from the *Mercurius Vitæ*; tho' it were ſtill better to lay it quite aſide, and ſubſtitute for it a Spirit of Vitriol, or Clyſſus of Antimony.

20. To conclude; we ſhall only mention the Remarks *Becher* makes on the Properties of theſe three Species of Acids, *viz.* The vitriolic Acid has the Power of fixing; the nitrous, that of tinging; the Acid of common Salt, that of volatiliſing and mercurifying: as in the firſt, the binding Earth predominates, and is diſſolv'd and carried over by the Acid; in the ſecond, the inflammable Earth; and in the third, the mercurifying ſort.

21. Sometimes theſe mineral Acids are alſo mixed along with Spirit of Wine, whereby they are ſenſibly deprived of their Acidity, and

and taſte quite pleaſant and mild, and are therefore call'd dulcified acid Spirits; nay, after this they incorporate with Alkali's both fix'd and volatile, almoſt without any Struggle or Effervescence; whence it is eaſy to imagine that they are conſiderably alter'd in their Virtues; only that it is not hitherto ſufficiently known what new Virtues either for chemical or medicinal Purpoſes they acquire. The dulcified Spirit of Salt is commonly cry'd up for extracting the Sulphur out of Gold, and making it into an *Aurum Potabile.* Dulcified Spirit of Nitre is commended as a noble Anti-colic, nay, an univerſal Antiſpaſtic and Paragoric; but Experience muſt firſt decide in this Matter. When we reflect on this new Mixtion of theſe dulcified Spirits, which is manifeſt from the reaſon of their Diſengagement, we may *à priori* conclude this or the other thing about their Virtues, both as to chemical and medical Uſes, and which alſo may coincide with practical Obſervations *à poſteriori*; and then we muſt examine what the Mixtion of Spirit of Wine is, and alſo what the component Parts of the acid Spirit we would mix therewith. Spirit of Wine is compoſed of a highly volatile vegetable Acid and a highly ſubtile inflammable Earth; but

Oil

Oil or Spirit of Vitriol, for Inſtance, conſiſts of the primogenial Acid and the fixing Earth of the firſt Kind, cloſely combin'd together. Now when the Oil of Vitriol comes in contact with Spirit of Wine, its Acid ruſhes againſt the inflammable Earth of the Spirit, and ſets it free from the volatile vegetable Acid; which thus freed, aſcends, and comes over with the volatile Acid of the Oil of Vitriol; but the more groſs inflammable Earth, which held this vegetable Acid, is deſtroyed by the mineral Acid, or rather abſorbed into the fixing Earth, and thereby fixed. Now this ſubtile Acid of Spirit of Wine has gain'd from the Oil of Vitriol a ſubtile Portion of a binding Earth, which is the volatile Part of the Oil of Vitriol, whereby it gently aſtringes and corroborates the ſolid Parts, ſo as again to recover them to their former Tone. The ſame thing alſo holds as to both the other Acids of Nitre and common Salt; that diſengag'd by Spirit of Nitre, combines with the volatile Part of the Spirit of Nitre, which is an acido-ſulphureous Matter; juſt as the volatile Part from Oil of Vitriol, aſſociated to the Acid of Wine, is an acid-earthy Matter, endowed with a fixing Quality. On this Footing is the Acid from Nitre, in reſpect of the

evaporated

evaporated Sulphur, an Anodyne and Antispastic; nay, not without reason deem'd an universal Paragoric, when well prepar'd. But the Acid of Wine prepar'd with, or disengag'd by Spirit of Salt, and to which the volatile Part of the Spirit of Salt associates, has gain'd a resolving Virtue; and hence it commences an universal Aperient and Resolvent, not to be despised in Medicine when carefully prepared from the Spirit, disengaged with Oil of Vitriol, or rather Oil of Salt, in a due Proportion. We must here mention, that these dulcified Spirits require great Accuracy in the Preparation; and this we are not to expect from a common Chemist, but from one who understands the Mixtions of Bodies, and how to proportion the Degrees of Fire and the Quantities to the Mixtion; and on this Footing such a Person will be capable of applying these Spirits to chemical Uses; as we have already hinted, that that from Spirit of Nitre has an Ingress into Gold: but these Matters relate to higher Speculations.

22. The most usual Acids from the Vegetable Kingdom are, distilled Wine-Vinegar, Spirit of Honey, Spirit of Oak, Guiaiac, and other the like hard Woods; and they are for the most part employed in dissolving Pearls and

and Corals, and extracting a Tincture from Glaſs of Antimony; they alſo diſſolve ſome Metals, as Iron, Copper, and calcin'd Lead, yet very ſparingly: and among all the known Preparations, there is none but Sugar of Lead, Cryſtals of Verdigreaſe, and in fine, *Beguinus*'s and *Hartmannus*'s green Precipitate, which are diſſolv'd and extracted with diſtilled Vinegar.

CHAP. III.

Of the Salſa, *or neutral Salts.*

1. FROM the Combination of Acids and Alkali's reſult neutral Salts; and as both the ſeveral Acids and Alkali's differ in their Natures, we may eaſily imagine there will be different Species of Neutrals.

2. But we ſhall only conſider the following threefold Diſtinction; either they are fix'd or volatile, ſolid or liquid, fully ſaturated or exceeding either in the alkaline or acid Part.

3. It would cauſe too great a Variety to diſtinguiſh them according to the various Species of Acids and Alkali's; for Inſtance, from

the nitrous Acid and a fix'd Alkali combin'd there arises a *nitrum regeneratum*; the Acid of common Salt and a fix'd Alkali yield the *Sal digestivum Sylvii*; the *vitriolico*-sulphureous Acid combin'd with a fix'd Alkali from Tartar or Pot-ash, produces the *Tartarus vitriolatus*; but if combin'd with the alkaline Portion of Nitre, the *Arcanum duplicatum*, the *Nitrum sulphuratum*, or *Sal polychrestum Glasseri*, as also the *Nitrum Antimoniatum*; and if conjoin'd with the alkaline Portion of common Salt, we obtain *Glauber*'s *Sal mirabile*.

4. From a fix'd Alkali and distilled Vinegar we procure the *Arcanum tartari*, or the *Terra foliata tartari*; but crude Tartar, saturated with its own or other fix'd Alkali, yields the *Tartarus tartarisatus*: Take the volatile Alkali's, or urinous Spirits, wherewith to change the Acidity of crude Tartar, and you have a soluble Tartar.

5. In other Respects, urinous Spirits combin'd with any Acid whatever, give a *Sal Ammoniac*; among which, that from Spirit of Salt and Spirit of Urine comes nigheſt the common sort; the Salt from Spirit of Nitre and an urinous Spirit shoots into oblong Crystals like Nitre, but suffers itself to be totally sublimed; the Salt compounded from Oil of Vitriol

Vitriol and Spirit of Urine is *Glauber's Sal ammoniacum ſecretum*, on which he has writ a whole Treatiſe.

6. Diſtilled Vinegar, ſaturated with an urinous volatile Spirit or Salt, gives no dry Sal-ammoniac, but an oleaginous Liquor, which aſcends next after the Phlegm, and comes over in fatty Veins, and which therefore may not improperly be called a liquid Sal-ammoniac; and to this Head belongs alſo the Liquor *C. C. Succinatus*, which others, tho' miſtakenly, reckon among the nitrous; ſince it is only ſuch a liquid Sal-ammoniac, ariſing from the Combination of the volatile Salt of Amber, as an Acid, with the volatile Salt of Hartſhorn, as an urinous Salt.

7. If according to the above threefold Diſtinction we reduce the Neutrals to certain Claſſes; to the fix'd Neutrals we may reckon the *Tartarus vitriolatus*, the *Arcanum duplicatum*, *Glauber's Sal mirabile*, &c. The volatile Neutrals are, *Glauber's Sal ammoniacum ſecretum*, the *Liquor C. C. Succinatus*; this indeed a liquid, that a ſolid Salt. Crude Tartar is a Neutral, wherein notwithſtanding the Acid prevails; but mix'd with an equal Weight or equal Parts of a fix'd Alkali, we have a Neutral, wherein for the moſt part the Alkali

predominates; and ſuch is the *Tartarus tartariſatus.*

8. We are further to remark of the Neutrals, that ſome of them are again eaſily decompounded; for Example, the *Nitrum regeneratum*, the *Sal digeſtivum Sylvii*, Salt of Tartar ſaturated with diſtilled Vinegar, or the *Terra foliata tartari*, all by means of Oil of Vitriol; the ammoniacal Salts, by means of Salt of Tartar, and any one Alkali; but others again, particularly thoſe combin'd of the vitriolic Acid and a fix'd Alkali, have ſuch a firm Mixtion, as to be decompounded by no Force of Fire, nor even by any other Acid or Alkali, but only by the Addition of a ſubtile Fat or inflammable Matter; for then the Acid, along with the inflammable Subſtance, commences a genuine Sulphur, and the Alkali is again ſet at liberty. *Vid. Stahl. Zymotech.* p. 117, 119. *It. ejuſd. Obſerv. Chym. Menſ. Jul.* as alſo his *Anleitung zur Metallurgie, &c.* p. 403. §. 32.

9. Before we conclude this Subject of Neutrals, we muſt ſubjoin ſomething on the vitriolic Neutrals; ſome call them acid Salts, as in diſtilling they give forth an acid Spirit; but it were better to claſs them next to the Neutrals; for as from the Combination of

Acids

Acids and Alkali's the neutral Salts arise, so from the Conjunction of an acid with a metallic Earth, a Vitriol.

10. The best known and most in use among these Salts, are the Vitriol of Iron and Copper, the Crystals of Verdigrease, green Mercury precipitate, *Mynsichtus's Sal Jovis*, Sugar of Lead, the lunar Crystals, or *Lapis infernalis argenteus*; as also the several Tinctures, or rather Solutions, both solar and martial; for Instance, the *Tinctura martis cum succo pomorum Borsdorff. Cum succo cydon. Wedelii helleborata, & Ludovici tartarisata.* And it would be no Impropriety to reckon here Tartar emetic, emetic Infusions made with Wine, or even mineral Turbeth, Mercury precipitate and sublimate.

CHAP. IV.

The sulphureous Productions.

1. THE sulphureous Productions are, as we mention'd above, threefold, *viz.* either liquid or volatile, as the distilled Oils and ardent Spirits; or of a mean Con-

ſiſtence, as the Eſſences and Extracts of Vegetables, and moſt of the expreſſed Oils; or of a dry and ſolid Form, as the Flowers of Sulphur and Benjamin, the Roſins of Scammony, Jalap, Gum-gutta, and Cinnabar.

2. The diſtilled Oils are either æthereal or empyreumatic; the æthereal Oils come over before or along with the Water, but the empyreumatic all together at laſt, after all the Phlegm is brought over; the former retain the Smell and Flavour, and doubtleſs alſo the Virtues of their Simples; but the latter acquire a great degree of Nauſeouſneſs, even tho' diſtilled from the moſt fragrant Subjects, as are Roſes and Violets; and tho' by Rectification *in Balneo* a Part as ſubtile and volatile, nay, even as clear and ſparkling as the æthereal, may be procur'd, yet they ſtill want of their beſt Property, their agreeable Odour; the former Oils can only be procured from ſome Vegetables, and that in a ſmall Quantity; but the latter from almoſt all animal and vegetable Subjects, and in a conſiderable Quantity.

3. Among the Simples, which yield theſe æthereal Oils, the Turpentine-Tree holds almoſt the firſt Rank; next come the Cones and Sprigs of the Firr, with the Berries of

Juniper,

Juniper, all which yield a conſiderable Quantity thereof; whence they are often uſed to increaſe, or rather adulterate the æthereal Oils of ſuch Plants as yield but a little: but this Cheat is diſcover'd ſeveral ways; for Inſtance, the genuine diſtilled Oils from Plants, and moſt aromatic Drugs, diſſolve in an alkaliſate Spirit of Wine, which the ſophiſticated never do. The diſtilled Oils adulterated with Oil of Turpentine, eraſe or diſcharge the Writing on the Paper, wherewith the Glaſs, in which they are kept, is ty'd up, but not ſo the genuine: and in fine, when ſuch adulterated diſtill'd Oils have ſtood for a long time, they turn clammy, and their Turpentine Odour becomes more and more ſenſible.

4. Beſides the Matters above-mention'd, all odoriferous Seeds, as Fennel, Aniſe, Cummin, *&c.* nay, even their Stalks, and moſt aromatic Drugs, as Cinnamon, Cloves, Nutmeg and Mace, alſo ſome Woods and Roots, as Saſſafras, Red-wood, Angelica, *&c.* yield much æthereal Oil; whereas moſt Herbs, as Baulm, Mint, Thyme, Marjoram, but eſpecially the odoriferous Flowers, as of Roſes, Roſemary, Pomgranates, Jeſſamin and Citrons, afford very little; ſo that formerly at *Florence* a whole hundred Weight

of freſh Roſes was diſtilled, and ſcarce an Ounce of Oil procured.

5. From the odoriferous diſtilled æthereal Oils, by Addition of the expreſſed Oil of Nutmeg, or with blanched Wax, all manner of Balſams are made; they alſo diſſolve in an alkaliſate ardent Spirit, and then they are called liquid Balſams, which *Glauber* teaches how to re-coagulate by means of their own fixed Salt diſſolved in their own Water, and bring them to a ſoapy Conſiſtence, ſhewing how they may be uſed inſtead of the common Balſams, which are too greaſy.

6. The empyreumatic Oils are only uſed externally in Contuſions of the nervous and tendinous Parts, and in Tumours of the Glands, in which Caſes they are ſtrong Reſolvents and Diſcutients; as *Wedelius*'s *Balſamus vulnerarius* is only the fætid Oil of Tartar mixed up with one or two Parts of Balſam of *Peru*: to give them internally is not ſo adviſeable, as they cauſe too great a Commotion in the Blood, a Drop or two being capable of moving the whole Maſs.

7. The ardent Spirits hold the firſt Rank, and indeed ariſe from the ſame Particles, which, without a preceding Fermentation, would become a diſtilled æthereal or empyreumatic

reumatic Oil: but as theſe Spirits produc'd by Fermentation may be a-new impregnated with the Smell and Taſte of other Simples, they then acquire new Denominations, not from the firſt Subject, from which by Fermentation they were prepar'd, but from thoſe by which they are now ſpecificated; yet with this Diſtinction, that the former are called ardent Spirits prepared by Fermentation, but the latter abſtracted Spirits.

8. Nay, we might ſtill add a third Species, *viz.* when one or more Simples are put in during the Fermentation, from which the Spirit afterwards borrows its Flavour and Smell, and its Name too, tho' its proper Body be from ſome other Subject: For Inſtance, when Sugar is diſſolved in Water, and this Solution poured on freſh Roſes; or if new Beer, eſpecially that of Wheat, be poured on Elder-flowers, and they be afterwards ſuffer'd to ferment together, with the Addition of ſome freſh Yeſt, and an ardent Spirit be diſtilled therefrom, the Spirit will ſmell and taſte ſtrong of Roſes and Elder-flowers, and may therefore be called a Spirit of Roſes or Elder-flowers; tho' properly ſpeaking it be produced from the Sugar or new Beer by means of Fermentation, which might therefore be

be called a Confermentation; a Method greatly adapted to ſuch Simples as of themſelves yield but little Spirit, ſuch as are the moſt Herbs and Flowers.

9. On the contrary, the Seeds and ſweet Juices of Vegetables give forth a much larger Proportion of ardent Spirits; for Inſtance, Juniper-berries, Elder-berries, Raſberries, Apples and Pears, Sugar, Honey, and Muſt, but in particular Rye, Wheat, and Barley; Peas alſo yield a good deal, but an unpleaſant Spirit; whereas that from Oats is very pleaſant, but in ſmall Quantity; as *Ludovici* teſtifies from his own Experience, in his *Annotationes* ſubjoined to his *Pharmacia*; and he computes, that as a *Weimar* Buſhel of Rye gave 90 lb. of Spirits, one of Barley, 65 lb. a Buſhel of Oats ſcarce yielded 18 lb.

10. The abſtracted Spirits are prepared as follows: Take Wine, or its Spirit, or good Malt-Spirits, pour them on the Plant whoſe Spirit you want; for Example, on Camomile, Lavender, or Roſemary-flowers; let them ſtand together and macerate for ſome time, at leaſt for eight Days; then draw off the Spirit by the *Veſica* or Alembic, and let it run ſo long as fatty Veins appear in the Still-head, or ſo long as it ſmells and taſtes ſtrong; for

what

what comes over laſt ſmells almoſt ſtronger of the Plant than the ſtrongeſt Spirit, which comes over firſt. If you would impregnate it ſtill more, and render it ſtronger in Taſte and Smell, you may pour it once or more times on freſh Plants or Species, and after due Maceration draw it off again; in this manner, not only the ſeveral odoriferous ſimple Spirits, or ſpirituous Waters, are made with Wine, as the Spirit of the Lilly of the Valley, Elder-flowers, the Cinamon, and Balm-waters, with Wine, *&c.* but a vaſt Number of compound Spirits, the ſeveral Aqua Vitæ's, antapoplectic, antepilectic, cephalic, ſtomachic, hyſteric, *&c.* Waters.

11. We muſt not here omit, that for ſome reſinous Subjects, as Amber, Maſtich, Aloes-wood, and Balſam of *Peru*, wherein the fragrant Portion is wrapt up and entangled in numerous viſcid Particles, Infuſion and Digeſtion with bare ardent Spirit is not ſufficient properly to open them, but that it is alſo neceſſary to call in Aid ſome Salt of Tartar, or other pure alkali Salt. *Vid. Hoffmann. Diſſ. de Balſ. Peruv.* p. 18, 19. *It. Annotat. ejuſd. in Poter.* p. 440. ſeq.

12. From

12. From what we have hitherto said about the Manner of impregnating ardent Spirits, by abstracting them from other Simples with a new Odour, Flavour, and Virtues, we may easily determine the Dispute, whether ardent Spirits be all of the same Nature, or whether the Spirit procured from Wine, its Lees, from Mead, Sugar, Wheat or Rye, may indiscriminately be used one for the other; for tho' we should grant, that by the Addition of another Simple during Fermentation, or after Fermentation, by the bare Abstraction therefrom they would be considerably alter'd in Taste, Smell, and Virtues, yet doubtless in the first Fermentation and Distillation from the Ingredients from which they were produced, they would carry over along with them a peculiar Smell, Flavour, and Virtue, which for the most part they would retain in Rectification. Thus *Borrichius* has remark'd, that the Spirit from Mead or Honey has some Pre-eminence in asthmatic Affections; and *Becher* prefers the Spirit from Sugar to all other Spirits for Pleasantness; and the Spirit prepared from Wheat is far more palatable than that commonly distilled from Rye.

13. The

13. The Eſſences and Extracts of Vegetables are commonly made with Spirit of Wine, and yet other Menſtruums are no wiſe excluded; and Spirit of Wine is often not ſufficient alone to abſorb all the Parts to be diſſolved or extracted; as we plainly ſee in Myrrh, which even wholly yields not to a tartarized Spirit of Wine, but above a half is left behind, eaſily ſoluble in Water.

14. And when a Plant holds much gummy and gelatinous Parts, in that Caſe, as was ſaid above on Solution and Extraction, aqueous Menſtruums are the beſt; only there is this one Inconvenience, that ſuch Eſſences thus prepared keep not ſo well, but readily foul or muſty. In Extracts the Buſineſs ſucceeds better, as there the Menſtruum is reſeparated by Inſpiſſation.

15. Hence ſome, when they would uſe aqueous Liquors in the Preparation of ſuch Eſſences, impregnate them firſt with Salts; and on this depends the *Eſſentia alexipharmica Clauderi*, as alſo his *Elixir aperitivum.*

16. But we are in particular to obſerve of Purgatives, that by ſuch ſaline Menſtruums, eſpecially alkaline, they are greatly weaken'd, nay, entirely caſtrated; on which account others, as Dr. *Vaterus*, was uſed to take to his

his *Elixir purgans* the Lixivium remaining of the *Arcanum duplicatum*, as a neutral Salt.

17. But where you ſuppoſe Spirit of Wine to be either uſeful or neceſſary, in Imitation of Dr. *Michaelis*, you may always employ the ardent Spirit of the Plant itſelf, or at leaſt draw over or rectify common Spirit of Wine therefrom.

18. But ſuch Eſſences may be prepared from all Vegetables, nay, even from their ſeveral Parts; and in particular, ſuch are beſt adapted thereto as have any remarkable Odour and Taſte. In the Animal Kingdom there are very few Subjects employ'd in this View, except Caſtor, Vipers, and perhaps Mummies; tho' as to the laſt, the Spices wherewith they are embalmed from the Vegetable Kingdom, deſerve more Regard than the little that accrues to them from the Animal Kingdom. If you except the Eſſences of Ambergreaſe and Amber, and at moſt the Tincture made from Glaſs of Antimony with diſtilled Vinegar, we are to expect no great Matters from the Mineral Kingdom; for the tartarized Tincture of Antimony, as alſo the Eſſence or Tincture of Iron, and the Tinctures from Gold, are rather ſaline than ſulphureous Productions.

19. The

19. The expreſſed Oils come alſo under this Head, and are for the moſt part made from Vegetables too, and principally from their Seeds and Kernels; the beſt known and moſt in uſe is the Oil of Olives, Almonds, Peach-Kernels, Linſeed, Poppies, Rape-ſeed, *&c.* Beſides the Oil of Eggs, which is expreſſed from the Yolks boiled or roaſted hard, we have none of this Claſs from the Animal Kingdom.

20. We now proceed to the third Claſs, which conſtitutes the ſulphureous Productions of a dry and ſolid Conſiſtence; among theſe, the firſt are the reſinous Extracts, as the Roſin of Scammony, Jalap, Gum-gutta, which are alſo by ſome called Magiſteries; and indeed from other Simples, as Guiaiac, may ſuch Roſins be extracted with Spirit of Wine; but the above-mention'd purgative Roſins are moſt in uſe; and for extracting them, a non-alkaliſate, yet highly rectified Spirit of Wine, is the beſt adapted; and you muſt at leaſt take ſix Parts to one of that which is to be extracted, and the Remainder may be alſo extracted with Water; nay, even the Water with which at laſt the Roſins are ſeparated or thrown down from the Spirit be evaporated, and you have ſtill a gummy Extract.

21. In

21. In fine, under this Head are to be brought the Flowers of Benjamin and Sulphur, and Cinnabar too; of which last we have said all that was needful in the Chapter on Sublimation. Flowers of Sulphur are made by Sublimation in glass or close earthen Vessels; in subliming the Flowers of Benjamin, they commonly use a Cone of Paper only; yet according to *Hoffmann*'s Direction, fine Flowers, or rather Crystals, may be extracted from Benjamin by means of Water.

CHAP. V.

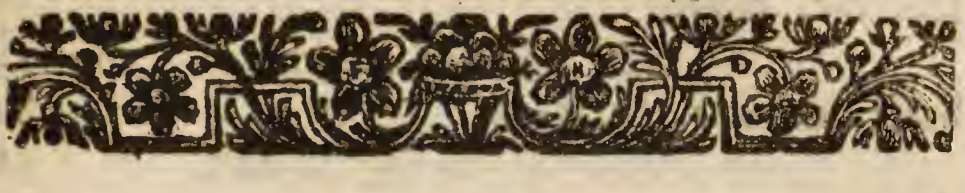
The Earthy Productions.

1. THE earthy Productions are such Matters, as have not only the Form of a Powder, Dust or Earth, or easily assume it, and are without any peculiar Odour or Taste; but which neither dissolve in Water, Spirit of Wine, or other aqueous or oleaginous Menstruum: now some of these are totally fix'd, so as to lose nothing in a naked Fire; others again are only semi-fix'd, and

and of theſe a good deal evaporates in a ſtrong Heat.

2. Of the firſt Species are moſt mineral and metallic Calces, made either by ſimple Calcination, or by Detonation with Nitre; as the *Antimonium diaphoreticum*; and which differ not greatly from it, Ceruſe of Antimony and mineral Bezoar, the *Terra vitrioli dulcis*, Minium, Litharge, and the ſeveral *Croci* of Iron and Sulphur. But it is worth remarking, that they loſe their Fixednes, and commence volatile, directly upon re-obtaining, by Reduction, their gloſſy and ductile metallic Form. Hither are alſo reducible the Parts of Animals, eſpecially the harder calcined ones, as burnt Hartſhorn, calcined Shells, and the ſpecific Febrifuge of *Strobelbergerus*.

3. To the ſecond Species are referable the *Crocus Metallorum*, Glaſs of Antimony itſelf, *Mercurius Vitæ*, the *Luna Cornua*, and *Plumbum Cornuum*, and moſt Magiſteries thrown down out of acid Solutions with an Alkali, or another Acid; for they retain much of the ſaline Particles of the Menſtruum employ'd therein; whence afterwards theſe ſaline volatile Particles not only evaporate in a ſtrong Fire, but often carry along



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